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The

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JULY TO SEPTEMBER, 1951

EDITORIAL

Tobacco Cultivation in Ceylon

FROM early times and, at any rate, for at least three centuries various types of tobacco—chewing, cheroot, cigar, pipe, and cigarette—have been cultivated in different part of the Island, but the greatest development took place in the Jaffna Peninsula where over 4,500 acres are now being grown under chewing and cheroot tobacco. The total extent under cultivation with the crop is reported to be about 15,000 acres of which about a third consists of the variety known as " Dumbara " tobacco, which is a mild cigar variety used also as a pipe tobacco and for the manufacture of cheap brands of cigarettes.

The quest for areas suited for growing good cigarette tobacco has, however, been carried out systematically only since 1912, and a number of experts have investigated the problem from time to time. But it was only during the last five years or so that real progress has been made with the development of cigarette tobacco in the Island. After years of experimentation and investigation a suitable variety of Virginian tobacco known as Harrison's Special was found to produce a leaf of reasonably good quality when grown under suitable soil and climatic conditions, for example in parts of the North-Western Province, the Dumbara area of the Central Province, &c. Recent statistics indicate that about 2,000 acres are now under this cigarette tobacco, and credit for this satisfactory state of affairs must go as much to the cigarette-manufacturing Companies, notably the Ceylon Tobacco Company, as to the Department of Agriculture officers responsible for the work. The Company has encouraged the cultivation of the crop in various ways but mainly

by assuring guaranteed prices—fixed by agreement with the Department of Agriculture—both for the green leaf as well as for cured tobacco, and by supplying the cultivators with seedlings and fertilizers as an advance against the sale of produce. The leaf is cured in flue-curing barns erected by the Company of which there are over 250 at present. The Company also advances growers with materials required for the construction of barns, for example furnaces, flue pipes, and roofing material. The cost is recovered over a period of years. The Department officers as well as the Company's field employees give all necessary advice to growers in regard to the cultivation of the crop. Other cigarette-manufacturing Companies have recently come into the field, but their activities up to now have been restricted to the purchase of cured tobacco at the prices fixed for the various grades. It is estimated that about 6,000 acres of cigarette tobacco will meet all the Island's present requirements of cigarette leaf, and it is evident, therefore, that if the remarkable progress made during the last few years is maintained, the Island should be self-supporting in this commodity in a comparatively short time.

The position in regard to tobacco cultivation in the Jaffna Peninsula is at present somewhat disturbing. The Jaffna tobacco cultivators have in the course of years developed a considerable trade with Travancore in chewing tobacco which is cultivated on a very large scale. The market for this product has, however, declined within recent years and is likely to fall appreciably in future. It is incumbent, therefore, that the Jaffna cultivator should be weaned from the cultivation of chewing tobacco in favour of other varieties which would be found suitable by trial. The Department has conducted investigations with cigarette tobacco in the Peninsula during the past two years and has determined on certain areas which are suited for the crop. These trials have indicated that high yields of reasonably good quality cigarette tobacco could be produced, but the cultivator will have to be educated to severely restrict his usage of water and green manure. The trials have been extended on a large scale this season and there is a likelihood that Jaffna might become in the future one of the important cigarette tobacco producing districts in the Island. The returns from this crop are likely to be as profitable as from the chewing variety. In view of the present situation in the Jaffna Peninsula, Government has just appointed a Committee to investigate report on the cultivation and marketing of tobacco in the Island a make recommendations for their improvement. The findings of this Committee will be awaited with considerable interest particularly because of the solution it might offer to the plight of the Jaffna tobacco industry.

In regard to Dumbara tobacco, the Companies have recently established buying floors at different growing centres in order to ensure that cultivators get optimum prices for their produce by the elimination of the middleman. An extension of the acreage under this variety of tobacco could, therefore, be anticipated. Trials conducted by the Department have, however, shown that certain imported varieties of cigar tobacco could be advantageously grown in certain districts, if a high quality product is desired.

Tobacco, whether of the cigarette or the cigar variety, should find a place in any rotational system of agriculture proposed for many areas of the Island suited for " Dry Farming ", as it is a very remunerative money crop. Precautions should, however, be taken to conserve the soil and to maintain its fertility by extending the interval between one tobacco crop and the next to at least two years. In some areas tobacco is grown year after year on the same land without any adequate protection against soil erosion. An endeavour is being made to rectify this pernicious system by education and propaganda on better land use. Tobacco can also be grown in rotation with paddy during the *yala* season where water is in short supply.

In this issue of *The Tropical Agriculturist* is published an article on the Tobacco Industry of the Island by Mr. A. B. Attygalle, Tobacco Officer of the Department. The readers of this journal and others who are interested in the cultivation of tobacco in the Island would do well to study this article carefully as it surveys the position admirably in regard to the present and future development of the crop. Judging from the article it is fairly obvious that, on the whole, the prospects for tobacco cultivation in the Island are favourable and cultivators could look forward to a period when reasonable, guaranteed prices will ensure for them a steady income without undue risk.

The Tobacco Industry in the Island

BY

A. B. ATTYGALLE,

TOBACCO OFFICER

ALTHOUGH it is not possible to state with precision the year in which tobacco growing was first introduced into the Island, there is good evidence to indicate that tobacco growing dates as far back as the early part of the 17th century.

The type grown at that time was the dark, coarse and strong-flavoured tobacco which was used for chewing. Cheroot tobacco which came in later was first grown in the Jaffna Peninsula for the purpose of export to places such as Sumatra, Penang and Travancore. The Southern Province in Ceylon also had a market for this commodity. As time went on the demand for Jaffna tobacco outside Ceylon was confined only to Travancore, but with the manufacture of cheroots which was introduced about a century ago the indigenous population adopted the smoking habit. This resulted in the extension of the growing of tobacco in areas such as Hiriyala Hatpattuwa, Dumbara, Trincomalee, Tamankaduwa, Negombo and Chilaw Districts. With the expansion of the cultivation the price of tobacco went down and the industry was in a plight.

In 1902, an attempt was made to cure Jaffna tobacco for the London market to be used as pipe smoking tobacco. Mr. Macdougal Gibson, an expert from abroad, was commissioned for this purpose. His investigations proved that the Pallai area in Jaffna Peninsula was best suited for mild-flavoured varieties for the manufacture of pipe-smoking tobacco. Tobacco grown in this area was favourably reported on in the London Market, but the project fell through owing to the opposition received at the hands of the cheroot manufacturers in the Jaffna Peninsula.

In 1910, the Ceylon Agricultural Society commenced a series of tobacco trials at Maha Illuppalama Agricultural Station and tested out mild cigar tobacco varieties imported from Java and Sumatra.

In 1911, a tobacco specialist, Mr. J. Van Leenhoff arrived in the Island to advise and report on tobacco cultivation at Messrs. Molsworth Brothers' estate at Trincomalee. His services were also commissioned by the Ceylon Agricultural Society to report on the trials at Maha Illuppalama Agricultural Station and by Government to visit Jaffna, Trincomalee, Dumbara Valley, and report on the possibilities of growing tobacco in those areas. Mr. Van Leenhoff, in 1912, considered there was no outlet for chewing tobacco apart

from the local market and trade with Travancore which was even then uncertain. He emphasised the necessity of carrying out more carefully-planned experiments. In regard to smoking tobacco he was of opinion that both cigar and cigarette tobacco could be produced for export to Europe and stressed the importance of adopting orthodox methods of cultivation and curing of tobacco.

In 1914, the services of Mr. B. Scherfius, another tobacco specialist, were engaged by the Government and he toured the tobacco growing centres—Jaffna Peninsula, Dumbara Valley, Matale North, Trincomalee, Chilaw and Kurunegala Districts. Trials were conducted in Tinnavelly in Jaffna with varieties of cigar, cigarette, pipe and chewing tobacco for the European market and on the termination of his engagement in June, 1917, he came to the conclusion that cigarette tobacco and high grade cigar tobacco could not be produced in the Jaffna Peninsula. However, he was of opinion that there were possibilities of growing White Burley for pipe-smoking and cigarette blends in the Jaffna Peninsula.

In November, 1918, Mr. W. B. Wilson, another tobacco adviser, arrived in Ceylon and took charge of tobacco trials at Teldeniya in Dumbara Valley and tested out a number of cigar varieties before leaving Ceylon in November, 1919. These trials were continued in the following year by the Divisional Agricultural Officer, Central Division. Samples of tobacco from these trials were sent to London as well as India, but were not favourably reported on.

It will be seen from the foregoing account that the initial trials in the growing of mild cigar and cigarette tobacco had not met with any appreciable success and there has been no continuity in the trials.

The need for carrying out further trials with cigarette tobacco in Ceylon was felt when it was found that other countries such as India, Nyasaland and Southern Rhodesia, Canada and Australia among others were producing cigarette tobacco, some of which was being used in good quality cigarettes manufactured in the United Kingdom. In 1931, trials were initiated at Wariyapola and Ganewatte Experiment Stations. The varieties tested out were Harrisons' Special, Virginia Bright Leaf, Big Gem, Bonanza, Hickory, Pryor, Jamaica wrapper, Willów Leaf and White Stem Orinoco. These trials proved that Harrisons' Special was the best variety suited for local conditions.

In 1934, the services of Mr. F. H. Cooper, Tobacco Expert of the British American Co., Ltd., were loaned to the Ceylon Government for a period of two months for the purpose of training some of the officers of the Department of Agriculture in harvesting, flue-curing, grading and processing of tobacco for the market. Cigarette tobacco grown at Wariyapola and Ganewatte Experiment Stations were flue-cured for the first time in 1934, under the able guidance of Mr. Cooper, in an improvised flue-curing barn. He was of opinion that the quality of Ceylon flue-cured leaf was up to standard and that the quality could be improved upon by adopting better methods of cultivation and curing the leaf in properly constructed, flue-curing barns.

Mr. Cooper, after training officers in the harvesting, flue-curing, grading and processing of cured tobacco for the market made a survey of the tobacco-growing centres and pronounced that cigarette tobacco could be grown successfully in Kurunegala District, Matale North, and other parts of the Dry Zone on light and medium sandy loams.

On recommendations made by Mr. Cooper, tobacco trials at Wariyapola and Ganewatte Experiment Stations were continued and two flue-curing barns were constructed. Trials conducted during 1935-1939 met with good success. The local cigarette-manufacturing Companies commenced the purchasing of Ceylon flue-cured leaf produced on Departmental Stations from 1938. The Ceylon Tobacco Co., Ltd., commented very favourably on the 1938 tobacco crop and gave the Department of Agriculture an assurance to buy all the flue-cured leaf produced by the Department.

Consequent to the success of the trials conducted during 1934-1938 the necessity was felt for the creation of a separate Division in the Department of Agriculture to further explore the possibilities of establishing a cigarette-tobacco industry in the Island. In 1939, Mr. W. M. Rogers was appointed Tobacco Officer and with his appointment the Tobacco Division was created to deal entirely with tobacco work. In addition to the trials on Departmental farms, Development Schemes for growing of cigarette tobacco by cultivators in the Kurunegala District were organised. In 1940, Messrs. Rothmans, Ltd., and the Ceylon Tobacco Co., Ltd., organised their own Development Schemes for encouraging the cultivation of cigarette tobacco by middle-class growers. These schemes functioned satisfactorily until 1942, and the extent under cigarette tobacco rose to 400 acres. The cost of production of tobacco increased on account of emergency conditions brought about by the World War II but prices paid for Ceylon, flue-cured leaf were not correspondingly raised. Hence the growing of cigarette tobacco by cultivators received a set-back and eventually in 1943 the cultivators gave up the growing of this crop. However, the Department of Agriculture continued the trials in Kurunegala District and also explored new areas with a view to introducing the cultivation of this crop.

Trials conducted in new centres at Anuradhapura, Maha Illuppalama Hingurakgoda and Budumuttawa, on well-drained paddy lands under controlled irrigation met with good success. These results proved beyond doubt that cigarette tobacco could be grown as an economic crop on paddy lands during Yala.

In addition to cigarette tobacco several mild American tobacco varieties were tested out at several centres with a view to replacing the local varieties. The broadleaf variety proved superior to the popular local variety Dumbara, both in respect of yield and quality. The cultivation of this variety is now being encouraged.

THE PRESENT POSITION

In summing up the results of trials conducted during the past 15 years it can now be stated with confidence that the experimental stage of growing cigarette tobacco in the Island is passed. In 1945, prices for Ceylon flue-cured

leaf were revised in consultation with the manufacturing companies, and Development Schemes were resuscitated for the growing of cigarette tobacco by cultivators.

As in other countries the tobacco consuming habits of the people of the Island too have undergone considerable changes during the past quarter century. The general direction of changes have been from " strong " tobacco to " mild ", from chewing to pipe smoking, and from cigars and cheroots to cigarettes and beedies. The changes may be associated to some degree with those that have taken place in the conditions of employment and modes of the life of the present generation. On account of these changes the most extensively cultivated type of tobacco (chewing) which enjoyed a good domestic market has by gradual stages dwindled to a limited and uncertain market today. The present market for this tobacco exists amongst the Indian estate population and, to a lesser degree, amongst the rural population in the Southern Province. In addition, the Jaffna chewing tobacco, which still has a limited market in Travancore, is also fast declining.

It will be seen from the trend of changes that have taken place during the recent past that the present demand is for milder types of tobacco. The types of tobacco now in good demand for domestic use are—cigarette, mild cigar (Dumbara) and beedi tobacco.

The annual requirements of the above types of tobacco for domestic consumption are —

Cigarette tobacco	3,000,000 lb
Mild cigar tobacco	3,000,000 lb.
Beedi tobacco	750,000 lb.

The acreage required to produce the above types of tobacco respectively are —

Cigarette tobacco	6,000 acres
Mild cigar tobacco	5,500 acres
Beedi tobacco	1,500 acres

CIGARETTE TOBACCO

During the last 5 years the Tobacco Division of the Department of Agriculture has made considerable progress in the production of cigarette tobacco in the Island. The cultivation of cigarette tobacco is practised on a commercial scale at the following centres :—

North-Western Province	Wariyapola, Ganewatte, Katupotha, Melsiripura, Beligama
Matale North (in Central Province) ..	Galewala, Kudawewa, Wahacotte
Kandy District (in Central Province) ..	Teldeniya, Mailapitiya, Unantenne
Nuwara Eliya District (in Central Province) ..	Hanguranketa, Rikillagaskada, Walapane

The growing of cigarette tobacco by peasant cultivators and middle-class growers and Rural Development Societies is being encouraged at the above centres in co-operation with the local manufacturing Companies. The present extent under cultivation is in the region of 2,000 acres. This is about a third of the total extent required for the production of the entire requirement of cigarette tobacco in the Island.

The growing of tobacco is encouraged under two schemes—green-leaf-purchase and the cured-leaf-purchase schemes. The green-leaf-purchase schemes are primarily meant for peasant cultivators. The manufacturing Companies advance the seedlings and fertilizers to the cultivators and buy their green leaf at agreed prices.

When payment is made for green leaf the value of seedlings and fertilizers is recovered from the growers on the basis of Rs. 20 per acre for seedlings and Rs. 60 per acre for fertilizers. The Companies cure the green leaf in their own flue-curing barns provided at different centres. This scheme has become very popular among the cultivators as it only necessitates the careful cultivation of the crop. The Department of Agriculture and the Companies give the necessary advice to the cultivators on the best methods of growing the crop. The cured-leaf schemes are for the benefit of middle class growers and Rural Development Societies who undertake the growing of cigarette tobacco on a large scale. The growers under this scheme have to provide their own flue-curing barns and cure their green leaf themselves. The minimum unit of cultivation required for operating a flue-curing barn is 5 acres. As in the case of green leaf purchase schemes the Companies advance the seedlings and the fertilizers and recover the value of these at the time of payment for cured leaf. Besides this the Companies assist growers under this scheme by advancing the following materials for the construction of flue-curing barns :—furnaces, flue-pipes, and roofing material. Recovery of the cost of these materials is spread over a period of 12 seasons. Any necessary advice and assistance in conducting these schemes are given by the Department of Agriculture and the Companies.

The prices for green and cured cigarette tobacco have been arrived at after discussion between the Director of Agriculture and the manufacturing Companies, with due consideration to the cost of production and the prevailing World Market prices for cigarette tobacco. The prevailing prices for green and flue-cured leaf are as follows :—

Green Leaf	*Flue-cured Leaf*
Grade 1—Cents 20 per lb.	Grade 1—Rs. 2·75 per lb.
Grade 2—Cents 08 per lb.	Grade 2—Rs. 2·50 per lb.
	Grade 3—Rs. 2·20 per lb.
	Grade 4—Rs. 1·35 per lb.
	Grade 5—Rs. 1·20 per lb.
	Scrap Rs. 1·00 per lb.

A general survey of the economics of tobacco cultivation in the Island as compiled from trials in Government Farms and Development Schemes during the recent past is tabulated below :—

CIGARETTE TOBACCO

		At Department Farms		*In Development Schemes*	
		Green Leaf Rs.	*Cured Leaf* Rs.	*Green Leaf* Rs.	*Cured Leaf* Rs.
Cost of production per acre at Government Labour rates		460	750	375	630
Yield per acre	at cents 20 per lb.	3,500 lb.	—	3,000 lb.	—
	at cents 8 per lb.	500 lb.	—	500 lb.	—
	at Rs. 2 per lb.	—	550 lb.	—	—
	at Rs. 1·90 per lb.	—	—	—	500 lb.
Gross Income per acre		740	1,100	640	950
Nett profit per acre		280	350	265	320

As stated earlier an extent of 6,000 acres is necessary to produce the full requirement of cigarette tobacco for the Island's consumption. At present only one-third of this extent is under cultivation in Ceylon and another 4,000 acres have to be brought under cigarette tobacco to meet the full demand. Cigarette tobacco is usually flue-cured and specially constructed flue-curing barns are required for this purpose. The cigarette manufacturing Companies in Ceylon have erected a large number of these barns at various Development Centres, but they are unable to undertake the construction of all the barns required for the balance 4,000 acres.

If, however, State aid could be provided for assisting the growers to construct these flue-curing barns, it is possible to complete the required 6,000 acres to produce cigarette tobacco to meet the full domestic demand and thereby save the large sums of money that are annually spent for importing the commodity from abroad.

In conclusion it may be said that cigarette tobacco is the most remunerative crop for the Dry Zone areas of Ceylon and the encouragement for the cultivation of this crop will help the growers to increase their income and enhance their food production capacity.

MILD CIGAR TOBACCO

Cost of production per acre on cultivators' land	Rs. 450·00
Yield per acre	550 lb.
Gross income per acre	Rs. 632·50
Nett profit per acre	Rs. 182·50

There is a good demand for this type of tobacco (commonly called Dumbara tobacco) for the manufacture of cheap brands of cigarettes, pipe smoking tobacco, mild cigars and cheroots. The approximate annual requirement of this type of tobacco is 3,000,000 lb. which could be produced from about 5,500 acres. The full requirement of this is produced in Ceylon.

In order to maintain the cultivation of this type of tobacco marketing facilities have been provided to enable cultivators to sell their produce direct to the manufacturers. The prevailing minimum prices for various grades of this type of tobacco, which have been fixed in consultation with the leading manufacturing Companies, are as follows :—

	Rs. c.
Grade 1	1 ·35 per lb.
Grade 2	1 ·15 per lb.
Grade 3	0 ·85 per lb.

The buying floors at which Dumbara tobacco is being purchased at present are as follows :—Melsiripura, Galewala, Kudawewa, Teldeniya and Hanguranketa.

Although the above margins of profits have been given as standard averages, it has been possible to realise nett profits ranging from Rs. 300 to Rs. 500 in the case of cigarette tobacco and up to Rs. 250 in the case of mild cigar tobacco, at Government Farms and Development Schemes during normal seasons.

BEEDI TOBACCO

Trials with beedi tobacco have been conducted on Departmental Farms for several years and there has been clear evidence that Ceylon could produce this type of tobacco to suit manufacturers. The demand for locally-grown beedi tobacco, however, is very poor due to the fact that traders prefer to import manufactured beedi from India as the labour rates for local manufacture are comparatively high. The low import duty together with the convenience of obtaining cheap manufactured beedies from India has not stimulated much of an interest in the local beedi-growing industry.

Genetic improvement in milk yield due to selection in a herd of Sinhala Cattle

BY

P. MAHADEVAN

IT is well recognized that the main object of any breeding programme is to change the genetic composition of a given population so as to increase the proportion of the more desirable genotypes in it at the expense of the less desirable ones. In consequence, the degree of success attained would depend firstly, on the accuracy with which the breeder decides on the animals that should be permitted to reproduce themselves. If no restriction of any sort is imposed on the animals in a given population and if all of them are allowed to leave progeny in equal numbers in the herd, then it is obvious that there would be no genetic improvement at all. Ordinarily, however, in dairy cattle breeding a certain amount of selection does go on at least through limitations on the size of the herd that could be maintained in a given unit. On the accuracy of such selection, which involves the estimation of the true genotypic values of the individuals comprising the population, would depend the actual genetic improvement achieved. But the appraisal of genotypic values is rendered difficult for most quantitative characteristics such as milk production in dairy cattle by the apparent lack of connection between phenotype and genotype. Since the production performance of a cow depends partly on the enviroment to which she is exposed and partly on her innate potentialities, any attempt to estimate the latter would be subject to some errors from mistaking the effects of enviroment for the effects of genes. The greater the non-genetic sources of variation affecting the character, the greater would be the errors in a phenotypic estimation of genetic merit. In other words, the accuracy of selection of genotypes on the basis of phenotypes is proportional to the heritability of the character.

A second factor which affects the genetic gain due to selection is the intensity of the selection practised. It can readily be seen that in a herd where a relatively small percentage of animals is selected for breeding, the average superiority of the selected group over the original herd would be greater than where a large percentage is retained if the accuracy of selection is the same in both cases. But there is a natural limitation to the selection intensity that could be practised, because if the population is to be maintained at a constant or expanding size the selection intensity would be dependent on the reproductive rates prevailing. The most useful measure of the intensity of

selection in a given population is the average superiority of the selected parents over the mean of the group from which they were selected with respect to the trait considered. This is termed the selection differential.

With a knowledge of the accuracy and the intensity of selection it should be possible to compute the changes in the genetic worth of a population in each generation within limits of sampling errors. But such an expression will be useful only where the animals belong to non-overlapping generations and where the inter-generation span remains constant. This is never attained in practice, and in consequence what is really needed is the genetic gain per year rather than per generation.

The interval between generations is therefore a third factor which affects the efficiency of selection. It is measured in terms of the average age of the parents when the offspring are born. Where the inter-generation span is long, other factors being constant, the rate of improvement per year would be small, and vice versa.

The probable annual change in average genetic worth of a population can then be calculated on the basis of these three factors, *i.e.*, the accuracy of selection, the intensity of selection and the interval between generations. A method involving the use of these factors has been employed in the present work to estimate the rate of improvement actually achieved by selection in a closed herd of black Sinhala cattle in Ceylon.

SOURCE OF DATA

The herd used for this study was founded in 1938, and is still in existence. No breeding stock has been introduced during this time and all the animals up to about the end of 1950 have been sired by home-bred bulls, thereby making it possible to calculate the selection actually practised in breeding both cows and bulls.

COMPUTATIONAL METHODS AND RESULTS

Dickerson and Hazel (1944) have shown that, if $\triangle G_g$ is the rate of change per generation in the average value of the genotypes in a population, i the intensity of selection in terms of selection differentials and h^2 the heritability of the trait, then

$$\triangle G_g = ih^2$$

In other words, the multiplication of intensity by accuracy of selection gives the average gain per generation.

But, the whole process of selection is really composed of four parts, namely the contribution of male and female parents to male offspring and of male and female parents to female offspring respectively (Rendel and Robertson 1950). These must therefore be computed separately, the total improvement being the sum of the individual components. The four components may be designated I_{BB}, I_{CB}, I_{BC}, and I_{CC}, where I_{BB} is the mean genetic superiority of bulls from which bull calves are bred over their male contemporaries, I_{CB} is the

mean genetic superiority of cows from which bull calves are bred over their heifer contemporaries, and so on. In the present herd I_{BB} and I_{BC} are zero, since there was no selection amongst bulls in the absence of progeny testing. Therefore, only I_{CC} and I_{CB} need to be computed.

A calculation was made in terms of selection differentials of the intensity of the selection (I_{CC}) practised in the present herd. Since selection was not all done at a given age (there being a continual selection at all ages), it was first decided to compute the selection differential on the basis of the first lactation only. This was done by weighting the first lactation record of each cow according to the number of daughters she left in the herd and comparing the average yield obtained by this process with the average of all first lactations in the group. This gave the " apparent" phenotypic selection differential as measured on the first lactation, and it was converted to a genetic measure by multiplying it by the appropriate figure for the heritability of milk yield.

There is a fair amount of evidence that within herds the heritability of milk yield is in the region of 0·25 (Lush 1940, Johansson 1947, Tyler and Hyatt 1947, Mahadevan 1950), and it is this value that was used here. The statement that the heritability of milk yield is one quarter means, in non-statistical language, that the difference in the breeding value of any two cows is, on the average, only one quarter of the difference between their records.

The " apparent " genotypic selection differential calculated above had a value 0·4 gallons. In other words, the average genetic superiority of the dams of cows based on the first lactation was 0·4 gallons. If all the culling were done on the first lactation, this figure would represent the true genotypic selection differential. The actual amount of culling on first lactation can, in fact, be calculated by comparing the first lactation yields of cows that also had a second lactation, with the average first lactation yield for the whole group. It was found, however, that in this particular herd there was no culling on first lactation, and that whatever selection was practised took place at later ages.

It was therefore evident that the genetic superiority of the cows chosen as parents, should be calculated on the basis of all available records. The figures for heritability used in such a computation would then be dependent on the number of available records for each cow. The genetic superiority, as shown by Rendel and Robertson (1950), would be given by $I_{CC}=\Sigma n h_1^2 (Y_1 - \overline{Y})$ where h_1^2 is the heritability based on 1 lactations, $\overline{Y}$ is the mean of the first lactations of the whole group, Y_1 is the mean of the lactations (standardised to first lactation) and n the number of daughters, for each cow. The values of I_{CC} thus calculated gave an average genetic superiority of dams of cows of 1·2 gallons (Table I). This is a threefold increase over that calculated on first lactations only.

The same method of calculation was applied to estimate the improvement (I_{CB}) achieved through the selection of dams of bulls as well. In this case each dam was weighted according to the number of daughters which her son had in the herd. The results obtained showed that the average genetic superiority of dams of bulls was 14·0 gallons (Table I). Combining this figure with the value of I_{CC} found above, we have $I_{CC} + I'_{CB} = 15·2$ gallons.

TABLE I

Estimation of selection differential from culling practised

	Genetic superiority based on the 1st to 4th lactations (gallons)	*Number of daughters in herd*
Dams of cows (I_{CC})	1·2 ..	63
Dams of bulls (I_{CB})	14·0 ..	133
Total (ΣI)	15·2 ..	

It has, however, been pointed out earlier in this paper that the best criterion of the efficiency of any breeding programme is the genetic improvement per year rather than per generation. Therefore, the figure 15·2 obtained above, must be divided by the total generation length in order to obtain the annual improvement. The total generation length (Σ L) itself can be calculated quite simply as the sum of the four components, L_{CC}, L_{CB}, L_{BC} and L_{BB}, where L_{CC} is the mean age of the dams when the heifer calves are born, L_{CB} is the mean age of the dams when the bull calves are born, and so on. The generation lengths for the Sinhala herd used in the present study are set out in Table II, and show a total generation length of 24·0 years. The total genetic improvement per year due to selection is therefore given by $\frac{15 \cdot 2}{24 \cdot 0} = 0 \cdot 6$ gallons. Since the average yield per cow in the whole population studied was 94 gallons, this means a rate of genetic improvement of 0·64 per cent. per year.

The generation interval for this herd is exceptionally long. Lush (1945) has estimated the mean generation interval (*i.e.*$\frac{\Sigma L}{4}$) in dairy cattle at 4-4½ years, and Mahadevan (1950) obtained a value of 4·9 years for Ayrshire herds in Scotland.

TABLE II

Generation Lengths

L_{CC}	=	78 months
L_{CB}	=	77 months
L_{BC}	=	65 months
L_{BB}	=	68 months
ΣL	=	24·0 years

The value of the above method for estimating the genetic gain due to selection lies not so much in the absolute value of the rate of advance calculated, but in the comparison of it with the rate of gain in other populations. The method employed may, however, be criticised on the grounds of the applicability of heritability figures derived from other herds and breeds of cattle to this particular herd. Although a reliable estimate of heritability within the herd itself could not be arrived at owing to the standard error of the estimate being large, the figures for repeatability (*i.e.*, the average correlation between different records of the same cow) indicate that the assumed values of heritability are probably applicable to this herd.

DISCUSSION

These results for Sinhala cattle are in general agreement with those obtained by Robertson (1951) for Fulani (private communication), and lead to the unavoidable conclusion that improvement by mass selection is a very slow business. Nevertheless, we would incline to the view that it is worth persevering with to some extent, provided it is carried out systematically. Proper selection entails a regular culling of animals on the basis of production performance. Merely increasing the number of animals in a herd would certainly not lead to any genetic improvement at all. The fact that, in the present herd, barely one sixteenth of the total improvement came from the selection of dams of cows shows that a large percentage of the cows which should really have been culled for low production, were allowed to remain in the herd and procreate. Moreover, whatever selection was practised was not all directed towards milk yield. Selection for other characteristics such as colour, type and conformation, without reference to milk yield, would naturally have lowered the selection differential on yield. It is no doubt true that these other characteristics must not be forgotten. For example, a point of conformation of particular interest to dairy farmers might be the shape of the hind leg. But, selection for these characteristics should not be at the expense of milk yield if the ultimate aim is to increase the milking potentialities of the herd. In this connection, the suggestion that draught might have been an additional criterion of selection in the Sinhala herd, and might have been a contributory factor to the low selection differential on yield, cannot be taken seriously because no attempt has hitherto been made to measure the draught propensities of any of these animals.

Other reasons for the low genetic gain in this herd are —

(*a*) Selection has often been incomplete, in that the offspring of cows which were themselves culled for low milk production were frequently incorporated into the herd. In consequence, what was effectively a cull became part of the breeding stock in the next generation.

(*b*) The interval between generations has been exceptionally long, resulting in a proportionately low rate of annual advance. This is mainly attributable in the present herd to the late age at first calving.

It has been suggested by different observers that progeny testing provides a useful method of increasing the rate of improvement. By progeny testing is meant the estimation of an individual's genotype by studying its offspring. Tyler and Hyatt (1948) have, however, shown by an analysis of Ayrshire records that a single record of a dam is a more accurate guide to the yield of her subsequent daughters than the average of her first three daughters. It is therefore evident that the use of progeny testing on the female side is highly limited. On the male side, it can be extremely useful, but the extra information provided by a progeny test about a sire's genotype must be weighed against the increase in generation length resulting from his use. Dickerson

and Hazel (1944) have concluded that in breeding for butter fat production in a closed herd of 120 cows, the genetic improvement will actually be faster without progeny testing. The main reasons for the ineffectiveness of progeny testing in small herds are that (*a*) when a sufficient number of cows have been used to provide an adequate test of young bulls, there are few cows left on which to use the tested bulls, and (*b*) the number of young bulls that can be tested is small and hence the value of the selection is limited.

Progeny testing therefore does not seem to provide a solution for increasing the rate of selection in a herd of the present size. In consequence, there are only two possible alternative tools at the breeder's disposal for bringing about any genetic improvement. One consists of the adoption of a more rigorous culling based on production performance, and the other involves the introduction of 'foreign blood'. As regards the first alternative, it may be worth noting that it is possible to show by a theoretical method of estimation that the maximum possible genetic gain under the best conditions of selection would be about twice the rate of advance actually achieved in this herd. The second alternative of introducing ' foreign blood ' may be a gamble, but nevertheless, if it is carried out scientifically, one may expect a rapid advance in productivity. It is our contention that these two alternative methods should go hand in hand, so that comparative data would be available from which a definite decision on breeding policy for Sinhala cattle could be arrived at.

Finally, a word of warning is required. Whatever breeding policy is adopted, one cannot expect great overall progress in dairy-cattle improvement if the level of feeding and management remains at a very low level. It is probably true to say that at the present time, the greatest advance could be made if the nutritional level of cattle in Ceylon is given serious consideration and substantial measures adopted for its improvement—though this does not necessarily mean that we should now concentrate entirely on environmental measures. Genetic differences between individuals are present on a sufficiently large scale to provide a basis for considerable increases in production over and above any which may be brought about by improved environment. It is only by a successful dovetailing of environmental and genetical methods that we can hope to derive the greatest benefits for our labours.

SUMMARY

The method used for the estimation of genetic gain due to selection in dairy cattle is outlined. An estimated gain of milk of 0·6 per cent. per year is given for a Black Sinhala herd in Ceylon. The reasons for the low rate of advance due to selection are discussed in relation to the rate of advance expected with other breeding methods.

ACKNOWLEDGMENT

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LITERATURE CITED

Dickerson, G. E., and Hazel, L. N. (1944). Effectiveness of selection on progeny performance as a supplement to earlier culling of livestock. J. Agric. Res. *69*, 459–476.

Johansson, I (1947). Studier över avkastningsvariationen inom svensk kullig boskap. K. Landtbr akad. Tidskrift. Arg. LXXXVI 140 pp.

Lush, J. L. (1940). Intra sire correlation or regression of offspring on dam as a method of estimating heritability of characteristics. Proc. 33rd Ann. Meet. Amer. Soc. Anim. Prod 293–301.

Lush, J. L. (1945) Animal Breeding Plans. 462 pp. Ames, Iowa : The Collegiate Press Inc.

Mahadevan, P. (1950) Effects of environment and heredity on lactation I. Milk Yield. J. Agric. Sci. (In press).

Rendel, J. M., and Robertson, A. (1950) Estimation of genetic gain in milk yield by selection in a closed herd of dairy cattle. J. Genet. *50*, 1–8.

Robertson, A. (1951) Private communication.

Tyler, W. J., and Hyatt, G. Jr. (1947). The heritability of milk and butterfat production and percentage of butterfat in Ayrshire cattle. J. Anim. Sci. *6*, 479.

Tyler, W. J., and Hyatt, G. Jr. (1948). The relative merits of a cow's own record and her progeny test for predicting the butterfat production of her future daughters. J. Dairy Sci. *32*, 657.

Studies in growth and yield of Cassava

1. Yield in relation to size and type of set

BY

K. N. JEYASEELAN,

SCHOOL OF AGRICULTURE, PERADENIYA

CASSAVA is an important supplementary food crop in Ceylon and produces a considerable amount of edible food even under poor conditions of soil and low standards of cultivation. The series of trials which has commenced with the present paper aim at investigating possible methods of increasing yields economically. In this paper is reported the results of an experiment involving the type and size of cuttings and the method of planting.

MATERIAL AND METHOD

The variety known as Philippine has gained popularity in Ceylon and is used in these studies. Cuttings were obtained from a plot planted in late *Yala 1949* and harvested in February, 1950. The soil for the experimental field was prepared after harvest of cowpeas by tractor disc harrowing. The depth of tillage was not more than three to four inches. The plots were planted on March 9, 1950. Weeding and planting of vacancies were undertaken three weeks later. Two subsequent weedings were carried out at intervals of one month. Lifting commenced on October 27, 1950. The experiment involved the following treatments :—

(T) type of set
- from apical end of stem (t_0)
- from basal end of stem (t_1)

(S) length of set
- six inches (s_0)
- twelve inches (s_1)

(M) method of planting
- horizontal planting (m_0)
- vertical planting (m_1)

The experiment consisted of the eight possible combination of the treatments replicated in four randomised blocks. The net extent of each plot was

15 feet × 15 feet—the best possible size and shape that could be fitted on the available land area, the sets being planted 3 feet apart both ways. In all cases the depth of planting was two inches or less.

RESULTS

The mean yields of the various treatments were as follows:—

t_1	basal cuttings	28,689 pounds per acre
t_0	apical cuttings	26,003 ,,
m_1	vertical planting	29,524 ,,
m_0	horizontal planting	25,168 ,,
s_1	twelve inch cuttings	28,604 ,,
s_0	six inch cuttings	26,088 ,,

The type of cutting and the method of planting have produced significant effects at the one per cent. level and the length of cuttings at the five per cent. level. None of the interactions reached significance. The inference is that basal cuttings, vertical planting and twelve inch cuttings have given better yields than apical cuttings, horizontal planting and six inch cuttings.

In the analyses of variance for yield in the first instance all blocks were used, but since in the subsequent analysis for tuber number only three blocks were used because of insufficiency of data for block one, the second analysis was also carried out. The results of both tally.

The analysis of variance for yields—

	Using four Blocks		*Using three Blocks*	
	d.f.	*m.s.*	*d.f.*	*m.s.*
M	1	4050	1	2646
S	1	1352	1	1176
T	1	1540·125	1	1734
M×S	1	18	1	4·17
M×T	1	325·125	1	400·17
T×S	1	55·125	1	28·17
M×S×T	1	78·125	1	16·67
Total treatments	7	1059·79	7	857·9
Blocks	3	585·75	2	493·5
Error	21	126·583	14	157·3
Total	31		23	

Although the experiment was carried out to study the effect of the above-mentioned factors on the yield of tubers, yet the number of tubers in each plot was also recorded in all plots except block one. This was necessary because considerable differences in tuber size were found to exist after harvest of the first few plots in block one. These numbers were subjected to statistical analysis to determine whether differences existed in the number

of tubers produced in each treatment and if so whether variations in yield could be explained on the basis of variations in tuber number. The mean number of tubers of the various treatments are given below along with mean yields.

Treatment	*Number of Tubers per Acre*	*Yields in Pounds per Acre*
t_1	59,650	28,689
t_0	48,686	26,003
m_1	51,681	29,524
m_0	56,655	25,168
s_1	59,199	28,604
s_0	49,137	26,088

The type and size of cuttings have produced significant differences at the one per cent. level. The basal cuttings and the twelve inch cuttings have produced larger number of tubers than apical cuttings and six inch cuttings respectively. The method of planting and interactions fail to reach significance. Vertical planting has not produced more tubers than horizontal planting.

The analysis of variance for tuber number was as follows :—

	d.f.	*m.s.*
M	1	3978·3
S	1	16276·0
T	1	19323·4
MxS	1	1190·0
MxT	1	84·4
TxS	1	1395·4
MxSxT	1	2752·0
Total treatments	7	6429·0
Blocks	2	1244·0
Error	14	1398·0
Total	23	

DISCUSSION

The present investigation supports the recommendations of Mendiola (1931) regarding the increase in yield brought about by the use of mature cuttings 25 to 30 cms. in length and also confirms the findings of Fernando and Jayasundera (1942) as regards the increase in yield resulting from vertical planting and the use of longer sets.

The yield of tubers in Cassava appears to be made up of two variable components—number of tubers per hill and the size of the individual tuber. It is seen from the results that the increase in yield obtained from vertical planting is not accompanied by an increase in number of tubers, whereas the increase in yield obtained from basal cuttings and twelve inch cuttings is accompanied by increases in numbers of tubers produced. In fact it was the observation on harvesting block 1 that horizontally planted sets yielded tubers of smaller size compared to tubers produced from vertically planted sets, that suggested counting tubers in the remaining blocks. It is quite likely that the better yields may be due to the larger number of tubers produced by basal cuttings and twelve inch cuttings and to the larger size of tubers in the vertically planted plots.

The adoption of figures of yield of crops in testing superiority appears therefore to be not quite justifiable in crops with no uniformity in the size of the product. This is specially so if the treatment itself is contributing to the size of the product. Besides yield other factors like number of tubers in the present instance should be considered, for estimating superiority.

The ultimate causes of the variations in yield and number of tubers due to vertical planting, horizontal planting, six inch cutting, &c., are difficult to explain. It appears likely that the distribution of the nodes on the sets and the amount of food stored in the set may be contributory factors.

CONCLUSIONS AND RECOMMENDATIONS

It will be seen from these results that better yields can be obtained by the use of longer cuttings in preference to shorter ones, basal cuttings instead of apical cuttings and the adoption of vertical planting instead of the ususal practice of planting the sets horizontally.

REFERENCES

1.—Fernando, M., and Jayasundera, E. S. (1942), *Tropical Agriculturist, Vol. XCVIII.*

2.—Mendiola, N. B. (1931) *Philippine Agriculturist, Vol. XX.*

Plant Diseases

Bakanae Disease and Foot Rot of Paddy

BY

J. W. L. PEIRIS,

PLANT PATHOLOGIST

THIS disease was first described from Japan by Hori (1898, 1907) and it was considered by him to be due to a species of *Fusarium*. It is known as the "Bakanae" disease in that country. Subsequently the disease has been reported from China, India, British Guiana and the Philippines.

In yala 1950 it was brought to the notice of the Division of Plant Pathology that plants in certain paddy nurseries sown with *Vellai Illankalayan* were dying out at the age of two or three weeks from sowing. Although these nurseries were in widely different situations the seed was ultimately found to have come from a common source. Reports of a similar failure of seed from the same source had been received the previous year and an investigation of the problem was taken up. Investigations revealed that the *Vellai Illankalayan* seed that had been sown in the nurseries where seedling failure had been observed was infected by a species of *Fusarium* which is capable of causing the death of seedlings and also producing certain symptoms on adult plants in the field. The fungus has been indentified as *Fusarium moniliforme* Sheld, the causal agent of the foot rot disease of paddy reported from other countries. The perfect stage of the fungus is known as *Gibberella Fujikuroi* (Saw.) Wr.

SYMPTOMS

The most serious phase of this disease is that which occurs on the seedlings. When infected seed is sown the seedlings become pale and "thin" and subsequently die out. It has generally been observed that this seedling blight occurs mainly from two to three weeks after sowing. In extreme cases practically total failure of the nursery or broadcast crop has been known to occur.

Seedlings that may survive the nursery stage may die out at transplanting. These seedlings are scattered throughout the field and not confined to patches. When examined the bases of the seedlings are observed to be rotten.

Plants that have survived the initial attack in the seedling stage show characteristic symptoms in the field which will enable easy diagnosis of the disease. A very accurate description of this aspect of the disease is given by Thomas (1931) as follows :—

" Scattered here and there in the field are tall lanky tillers which come into ' shot blade ' earlier than the rest of the crop but bearing pale green flags which shoot up conspicuously above the general leaf level of the crop. Viewed from a distance on a bright sunny day such pale flags mar the uniform level of a platform of green leaf tips. There is a corresponding emergence of culms of the affected plants from their sheaths revealing the base of internodes. Even the most experienced agriculturist would at first sight take the occurrence of stray plants of such abnormal development to be the result of an admixture of seed of a short duration variety—a feature not uncommon in the average ryot's fields ".

The abnormal height of infected tillers is responsible for the term "Man Rice" given to paddy affected by this disease in British Guiana (Martyn 1930).

In Ceylon this condition of abnormally elongated tillers is called by the cultivator " wanda peedema " (sterile ripening). Indeed no setting of seed occurs in the affected plants and they generally die off in a few days. Infected plants generally show hardly any tillering and the elongation is a result of accelerated growth at the expense of lateral development. It has been shown by Yabuta and Hayasi (1940) that two substances could be isolated from cultures of the fungus, one of them " fusaric acid " causing a retardation of the growth in rice seedlings even at a dilution of one part per million. The other is " Gibberelin " an organic acid which is capable of causing elongation of shoots of a number of plants including rice.

The elongation of tillers (Bakanae phenomenon) may be suppressed under certain conditions and the affected plants may remain normal or even stunted.

When an infected tiller is examined internally after splitting the culm there is almost invariably a discoloration at the basal node, which is in most cases visible even externally as a brownish sodden area. Generally the cottony mycelium of the fungus may be seen within the hollow of the culm and in advanced cases of infection nodal discoloration may also extend to one or two of the nodes immediately above the basal one. A progressive browning and drying up of leaves from base upwards is also a common feature of affected plants as also is the development of adventitious roots from the first, second and even the third node from the base. The root system however is generally unaffected but owing to the rot at the basal part of the stem (foot rot) the diseased plants when pulled, break off at the base leaving the roots in the ground. On plants that have been killed by the disease the causal fungus may be visible as a white or pinkish-white incrustation on the surface of the infected parts. This pinkish incrustation is composed of the mycelium of *Fusarium* and millions of its spores. It must not be forgotten however that there are numerous saprophytic species of *Fusarium* that form similar incrustations on various dead or dying plants.

PREDISPOSING CONDITIONS

The optimum soil temperature for the development of the disease has been shown by Seto (1935) to be 35°C. Infection failed to appear at 20°C or at 40°C. Certain cultivators in the Kegalle area affirm that the incidence of this disease is less in maha than in yala. This is obviously related to the comparatively higher average temperatures obtained in the yala season. Seto also believed that soil moisture too plays an important part in the development of the disease.

Thomas (1937) found that nitrogen applied to the soil either as cattle manure or as ammonium sulphate favoured the development of the disease. It has been our observation that the same infected paddy sown in different fields by different cultivators showed varying degrees of severity of the disease. There is no doubt that many factors are responsible in determining the severity of disease incidence.

DISTRIBUTION

The Bakanae disease of paddy has been so far recorded from Gampola, Kandy, Wattegama, Kadugannawa, Kegalle and Matugama. Although this disease has been recognised as such only recently it probably has been a long time in Ceylon and is found in mild forms wherever paddy is grown.

ALTERNATE HOSTS

It is known that *Fusarium moniliforme* can infect sugar cane, maize, barley, *Panicum miliaceum*, and *Andropogon sorghum*.

RESISTANT VARIETIES

The Coimbatore strain G. E. B. 24, Aryan and the American variety Wateribune are reported resistant as also a number of Japanese varieties.

CONTROL

The disease is to some extent soil borne and the stubble should be burnt whenever possible. It is however largely seed borne and fortunately the infection is mainly on the surface of the seed. Hence it is quite amenable to treatment. We have found that seed dusting with an organo mercurial fungicidal dust Agrosan GN at the rate of 2 ounces per bushel very effectively controls the disease. In India (Thomas 1933 and Sundararaman 1936) found that most of the standard fungicidal seed dressings gave good control and for practical purposes Ceresan or Agrosan at the rate 1 gm. per $\frac{3}{4}$ to 1 lb. of paddy has been recommended. Although organo mercurial seed dressings have been found very effective, owing to their poisonous nature their use, in the absence of suitable supervision in the actual dusting and subsequent handling of the treated paddy cannot be recommended. Under these circumstances less effective but non-poisonous fungicides like copper-lime dust may be used.

Bakanae Disease and Foot Rot of Paddy

Paddy plants affected by the Fusarium disease showing elongation compared with healthy plants.

Bakanae Disease and Foot Rot of Paddy

Paddy plants attacked by the Fusarium disease showing :—

(*a*) discoloration of the base.
(*b*) white mycelium at the base.
(*c*) discoloration of second internode.
(*d*) mycelium at upper nodes.

REFERENCES

Hori, S.(1898). Researches on " bakanae " disease of the rice plant—Nojishikenjyo Seiseki, xii,pp. 10—119 (Japanese).

(1907. Ine Bakanae-byo Higai no Chosashiken.—Nojishikenjyo Hokuku, No. 43. (Japanese).

Martyn, E. B. (1930). Botanical and Mycological Division. Annual Report, 1929.—Agric., J. Brit. Guiana, iii, pp. 226–233.

Seto, F. (1935). Beitrage zur Kenntnis der " Bakanae " Krankheit der Reispflanze.—Mem. Coll. Agric., Kyoto, 36.

Sundararaman, S. (1936). Administrative report of the Government Mycologist for the year 1935–36 (Detailed Report), in Admin. Repts. Agric., Entom., and Mycol., Madras, 1935–36, pp. 31–43.

Thomas, K. M.—(1931). A new paddy disease in Madras.—Madras Agric. J., xix, No. 1, pp. 34–36.

(1933). The " foot rot " of paddy and its control.—Madras Agric. J., xxi, pp. 263–272.

(1937). Administrative Report of the Government Mycologist for the year 1936–37, in Admin. Repts. Agric., Chem., Entom., and Mycol., Madras 1936–37, pp. 35–51.

Yabuta, T. & Hayasi,T.—(1940). Biochemical studies of " Bakanae " fungus of rice—J. Imp. Agric., Exp. Sta. Nisigahara, Tokyo, iii, pp. 365–400. (Japanese, with English summary.)

Division of Plant Pathology,
Peradeniya, August 8, 1951.

Wild Flowers of Ceylon: I

BY

J. E. SENARATNA

RESEARCH ASSISTANT IN SYSTEMATIC BOTANY

CEYLON has been bountifully supplied with wild flowers—many of them beautiful, striking, pleasure-giving. This heritage of flowers is particularly appreciated in a country where the custom of offering flowers at shrines in temples is practised by old and young.

Children also gather wild flowers to deck themselves with, or to brighten homes, and sometimes for the more serious purpose of study. In order to help in identification of the flowers and to give some information about them the present series of articles has been commenced.

Wild flowers are of many different kinds and each kind—that is, having the same characteristics with regard to the structure of the flower—is called a species. The species constitutes the unit of classification. Closely related species, having numerous characters in common and differing only in minor details—together form a genus, while related genera similarly group into a family.

In the botanical naming of any plant, two words are used—the first to indicate the genus and the second to indicate the species. These two words are followed by a third, usually abbreviated, the name of the person who first validly gave that name to the plant.

In the study of relationships, the important characters are those of the flower. In a typical flower there are four series of floral organs.

The outermost series is known as the *calyx*. It is commonly green and it completely encloses the flower when in bud. It is made up of a number of segments called *sepals*.

Next to the calyx is the series of brightly coloured *petals* forming the *corolla*.

The third series consists of *stamens* formed of *filaments* bearing *anthers* containing *pollen*.

The innermost series is the *ovary* composed of *carpels* containing *ovules*. The ovary is prolonged into one or more *styles* ending in *stigmas*.

PLATE I—1. *Anemone rivularis* Ham. 2. *Berberis aristata* DC. 3. *Michelia nilagirica* Zenk.
4. *Ranunculus sagittifolius* Hook.

1. Michelia nilagirica Zenk.
Val-sapu. (Sinhalese). Pl. I, fig. 3.

Family.—Magnoliaceae (Magnolia Family).

Description.—A much-branched small tree with a rounded head and smooth grey bark ; leaves short-stalked, 3 to 3½ inches long, 1 to 2 inches wide, whitish on the lower side with very fine silky hairs (very silky when young) ; stipules densely silky, joined to enclose the bud completely ; flowers 1¾ to 2 inches in diameter, borne singly at the ends of short twigs, on a short, stout, silky stalk, with usually 12 similar sepals and petals spirally arranged ; stamens and carpels numerous, spirally arranged.

Flower.—Sweet-scented, pale sulphur yellow, becoming darker on withering.

Time of flowering.—March, April.

Locality.—Common in forests above 5,000 feet, more rarely extending to 4,000 feet.

Distribution.—Also in the Nilgiri hills in South India.

Uses.—The wood is strong and very durable, providing excellent timber, locally called *Val-buruta*, which has been used for railway sleepers.

Note.—Belonging to the same genus is the well-known " *Sapu* " or " Champak " tree, *Michelia champaca* L., much cultivated for its timber.

Description.—A large tree 40 to 50 feet high ; leaves 4 to 8 inches long, 2 to 3 inches wide ; flower 2½ inches in diameter ; seeds scarlet.

Flower.—Yellow, very fragrant.

Time of flowering.—April and May.

Locality.—Introduced into Ceylon and naturalised in secondary jungle.

Distribution.—India and Java.

2. Ranunculus sagittifolius Hook.
Buttercup. Pl. I., fig. 4.

Family.—Ranunculaceae (Buttercup Family).

Description.—A perennial herb with leaves mostly at the base ; leaf-stalks very long and hairy ; leaf-blades arrow-shaped with rounded lobes at the base ; flowering stem upright, 2 to 3 feet high, branched, bearing a few narrow leaves and 4 to 10 flowers ; flowers ¾ inch in diameter, with 5 rounded petals and a rounded head of carpels.

Flower.—Bright yellow, shiny.

Time of flowering.—May, June, September.

Locality.—Common in wet or marshy places above 5,000 feet, especially at Horton Plains and Nuwara Eliya.

Distribution.—This species occurs only in Ceylon.

Note.—This is the common buttercup with conspicuous, shiny bright yellow flowers. There is in the same region in damp shady places a perennial, creeping buttercup, *Ranunculus wallichianus* W. & A.

This species has much-divided leaves, and inconspicuous yellow flowers $\frac{1}{3}$ to $\frac{1}{2}$ inch wide. It flowers from April to September. It occurs also in the Nilgiri hills of South India.

3. Anemone rivularis Ham.
Wild Anemone. Pl. I., fig. 1.

Family.—Ranunculaceae (Buttercup Family).

Description.—A perennial herb with leaves mostly at the base, the whole plant more or less hairy; leaf-stalk very long, up to 14 inches long; leaf blade 1 to 4 inches long, 2 to 8 inches wide, divided into 3 almost to the base, each lobe very deeply cut; flower-stem upright, 1 to 3 feet high, with narrower leaves and bearing 7 to 13 flowers; flower $1\frac{1}{2}$ inches in diameter; sepals 5 to 8, usually 7, slightly silky on the outside; petals wanting; stamens numerous; carpels numerous, each with a solitary pendulous ovule; fruit a rounded head of carpels.

Flower.—Bluish pink or white.

Time of flowering.—March, April.

Locality.—Locally abundant near streams above 5,000 feet, especially at Nuwara Eliya, Ambewela and Horton Plains.

Distribution.—In the higher mountains of India, abundant in the Himalayas.

4. Berberis aristata DC.
Barberry. Pl. I., fig. 2.

Family.—Berberidaceae (Barberry Family).

Description.—A perennial, erect, much-branched, thorny shrub; leaves in fascicles of 3 to 6, i.e., on very short branches from the axils of strong 3-branched spines (modified leaves) which are $\frac{1}{4}$ to $\frac{3}{4}$ inch long and very sharp; leaves 1 to $1\frac{1}{2}$ inches long, $\frac{1}{2}$ to $\frac{3}{4}$ inch wide, stiff, ending in a sharp point; flowers about $\frac{1}{2}$ inch in diameter, in clusters of 6 to 20 from the leaf-fascicles and longer than them; sepals 6, in 2 rows, the inner row twice as large as the outer; petals 6, in 2 rows, rather longer than the sepals; stamens 6, opposite the petals and slightly joined to the base of the petals; anthers opening by two upwardly recurved lids; ovary smooth, with 1 carpel, with a short style and a thick stigma.

Flower.—Bright yellow; fruit purple, with a white " bloom " which is easily rubbed off.

Time of flowering.—April to June and most other months.

Locality.—Very common in bushy open places above 5,000 feet.

Distribution.—In India, throughout the Himalayas from 6,000 to 10,000 feet and in the Nilgiri hills.

PLATE II—1. *Lawsonia inermis* L. 2. *Jussiaea suffruticosa* L. forma *villosa* (Lamk,) Alst. 3. *Woodfordia fruticosa* (L.) Kurz. 4. *Ammannia octandra* L. f.

Uses.—The wood is yellow and hard. The root-bark is used in India as a bitter tonic in fevers and an extract from the wood is used there as a local application in chronic ophthalmia.

Note.—The stamens are irritable, and bend over the stigma if touched at the base.

5. Woodfordia fruticosa (L.) Kurz.
Malitta (Sinhalese) Pl. II., fig. 3.

Family.—Lythraceae (Loosestrife Family).

Description.—A straggling shrub with many long arching branches covered with fine white hairs ; bark cinnamon-brown, shredding off in fibres ; leaves without stalks, 3 to 4 inches long, $\frac{1}{2}$ to 1 inch wide, finely velvety on both sides ; flowers in short clusters of 4 to 10, often on the old wood ; calyx over $\frac{1}{2}$ inch long, red and hairy outside, of six sepals, forming a slightly curved, somewhat inflated funnel-shaped tube with the tips of the sepals free and very short ; petals 6, very small, inserted on the tube between the calyx segments ; stamens 12, projecting much beyond the calyx-tube ; ovary with 2 cells and numerous ovules ; fruit about $\frac{3}{8}$ inch, enclosed in the calyx-tube which becomes vertically-split.

Flower.—Bright brick-red.

Time of flowering.—March, April and September to November.

Locality.—At 3,000 to 5,000 feet elevation, in open sunny places ; abundant on the Uva patanas as at Wilson's and Bandarawela.

Distribution.—India, China and Madagascar.

Note.—The stamens are of 3 forms.

6. Ammannia octandra L. f. Pl. II., fig. 4.

Family.—Lythraceae (Loosestrife Family).

Description.—An annual erect herb, 1 to 2 feet high, with ascending branches ; leaves on the main stem $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long, $\frac{1}{8}$ to $\frac{1}{4}$ inch wide, but smaller on the branches ; flowers about $\frac{1}{3}$ inch in diameter, in clusters of 3, on very short stalks ; calyx of 4 sepals ; petals 4 ; stamens 8 ; fruit broadly ovoid, enclosed in the calyx-tube.

Flower.—Bright pink.

Time of flowering.—March, April, July and September.

Locality.—Rather common in the dry region, as at Jaffna, Kurunegala, Matale and Dambulla.

Distribution.—Also in South India and Malaya.

7. Lawsonia inermis L.
Marutonti (Tamil). —**Henna, Tree Mignonette** Pl. II., fig. 1.

Family.—Lythraceae (Loosestrife Family).

Description.—A much-branched shrub, the lateral branchlets often ending in a sharp point ; leaves $\frac{1}{2}$ to $1\frac{1}{2}$ inches long, $\frac{1}{3}$ to $\frac{3}{4}$ inch wide ; flowers numerous, under $\frac{1}{2}$ inch in diameter, arranged in a pyramid-like cluster 6 to

12 inches long and 4 to 8 inches wide at the base, with its axes reddish ; calyx of 4 sepals with a very short calyx-tube ; petals 4 ; stamens 8, inserted in pairs ; ovary 4-celled, with numerous ovules ; fruit globose, under $\frac{1}{4}$ inch in diameter.

Flower.—With pinkish sepals and cream-yellow petals, very fragrant.

Time of flowering.—February, March.

Locality.—In the dry and arid regions especially near the sea coast as at Mannar, Batticaloa and near Chilaw ; it is abundant by the lagoons at Jaffna ; in the moist region it is cultivated only.

Distribution.—Also in Western India, Kabul and Persia, and much cultivated elsewhere.

Uses.—This is the " henna " the leaves of which are used for staining the finger-nails and teeth and for applying to the head.

8. **Jussiaea suffruticosa** L. forma **villosa** (Lamk.) Alst. Pl. II., fig. 2.

Family.—Onagraceae (Willowherb Family).

Description.—A perennial branched herb 2 to 3 feet high, thickly covered with short spreading hair ; leaves 2 to 4 inches long, $\frac{1}{4}$ to 1 inch wide, thickly hairy on both sides ; flowers $\frac{3}{4}$ to $1\frac{1}{4}$ inches in diameter ; calyx hairy, of 4 sepals ; petals 4, rounded, yellow ; stamens 8 with very short filaments ; ovary below the sepals, with 4 or 5 cells, hairy ; style very short, stigma large ; fruit about 1 inch long, splitting lengthwise ; seeds very numerous.

Flower.—Bright chrome yellow.

Time of flowering.—September, October.

Locality.—Common in wet places from sea level to 3,000 feet elevation.

Distribution.—Throughout the world in warm countries.

Acknowledgement

My thanks are due to Mr. G. L. de Silva, draughtsman, for the preparation of the plates from the drawings in the Peradeniya Herbarium collection.

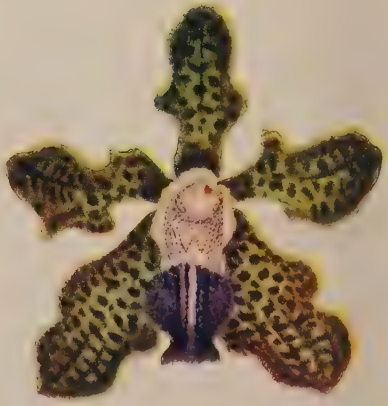
1

4

2

5

3



6

3 Inches

PLATE IV—*Vanda tessellata* (Roxb.) Hook. 1. yellow form. 2. forma *lutescens* Alst.

The Orchid Vanda tessellata (Roxb.) Hook.

(*Vanda roxburghii* R. Br.)

Retta (Sinhalese), *Arattai* (Tamil). (E. Roberts)

BY

J. E. SENARATNA

RESEARCH ASSISTANT IN SYSTEMATIC BOTANY

THIS is a rather common orchid growing on forest trees in the dry regions of Ceylon.

The plant has a stout, simple or branched stem about $\frac{1}{3}$ inch in diameter and usually 1–2 feet (sometimes 6 feet) long, clinging to the tree trunk by stout, simple and branching roots about $\frac{1}{5}$ inch across.

The leaves are arranged in two rows along the stem with their bases closely overlapping. The stem may be bare of leaves at the base, but higher up it is covered by bases of fallen leaves and ultimately by the leaves.

The leaves are sickle-shaped, thick, 6–8 inches long, broady ' V ' shaped in cross-section, each arm of the ' V ' being $\frac{1}{3}$–$\frac{1}{2}$ inch long, the leaf-tip consisting of 2 unequal, rounded lobes and a short acute interposed one.

The flowers are borne in clusters of 6–10 towards the end of a stout green stalk 6–8 inches long, arising in the angle of a leaf and stem.

The flower is strongly sweet-scented, about $2\frac{1}{2}$ inches in diameter, pale buff or grey tessellated with brown lines, with a white margin, and a greyish blue lip dotted with purple.

The colour of the flower varies greatly and some of the different forms (shown in Plate III) have received distinctive names. These are—forma *lutescens* Alston, with the sepals and petals greenish-brown, not tessellated, from Dambulla (fig. 2) ; forma *rufescens* Alston, with the sepals and petals reddish, from Madu (fig. 3) ; the yellow form (fig. 1) has been observed at Dambulla. The other 3 forms (figs. 4 to 6) are rather common throughout the dry zone.

The plant flowers usually from March to August.

This species occurs also in India and Burma.

2——J. N. B 10371 (9/51)

Departmental Notes

From the Botanist's Division

The issue by the A. R. OO and the B. & S. A. R. O. of the selections listed below is announced.

Crop	*Selection*	*Remarks*	*Seed available from*
Root Crops :			
Cassava	MU 22	Excellent table variety; Yield good	Botanist's Station, Katugastota
Do.	MU 73	High yielding, good-quality, yellow-fleshed table variety	do.
Do.	MU 6	High-yielding, good-quality, white-fleshed table variety	do.
Do.	MU 41	One of the highest-yielding of varieties but develops high concentrations of prussic acid ; suitable for starch production	do.
Do.	MU 51	A dual-purpose variety ..	do.
Do.	MU X 4	A hybrid combining yield and quality	do.
Do.	MU X 8	A hybrid combining yield and quality	do.
Do.	MU X 21	A hybrid combining yield and quality	do.
Sweet Potato	IB 15	A high-yielding, fine-flavoured, yellow-fleshed variety	do.
Innala	CT 2	Selection for yield and quality	do.
Legumes :			
Lima Bean	X 36—46/1	White-seeded, high-yielding, pole variety of hybrid origin	do.
Do.	X 36—46/1	do.	do.
Do.	X 36—46/5	do.	do.
Do.	X 36—46/6	do.	do.
Do.	X 36—46/8	do.	do.
Velvet Bean	MP—1	Selected for yield and quality	do.
Jack Bean (*Canavalia ensiformis*)	CE—1	High-yielding and of excellent quality	do.
Dhal (*Cajanus cajan*)	Tur 5	Early-flowering and high yielding	Botanist's Station, Katugastota, and Maha Illupalama Farm

Crop	*Selection*	*Remarks*	*Seed available from*
Cereals :			
Paddy	.. C—12 ..	High-yielding and non-lodging; milling quality good, recommended for trial in dry zone in *maha*, particularly by the North-Central Province; has outyielded *Vellai Illankalayan* at Maha Illupalama Age : 4–4½ months	Batalagoda Rice Research Station and Maha Illupalama Farm
Do.	.. C—20 ..	High-yielding and non-lodging; milling quality good, recommended for trial in dry zone in *maha*, has consistently and strikingly out-yielded *Vellai Ilankalayan* at Batalagoda Age : 4–4½ months	Batalagoda Rice Research Station and Maha Illupalama Farm
Do.	.. C—104 ..	High-yielding and non-lodging; milling quality good, recommended for trial in dry zone in *maha*, has out-yielded *Vellai Ilankalayan* at Maha Illupalama Age : 4 months	do.
Do.	.. Ptb—16 ..	Yield and quality good; recommended for trial in dry zone in *maha*, has out-yielded all Departmental long-aged pure lines at Polonnaruwa Age : 5½ months	do.
Sorghum	.. San-Pyaung ..	Selection for grain and fodder	Maha Illupalama Farm
Do.	.. Tambagalla ..	Selection for grain ..	do.
Miscellaneous :			
Tuticorin Chilli	.. CA 200 ..	Selection within the H—1 for yield and quality	do.
Deccan Hemp (*Hibiscus cannabinus*)	Vizianagram ..	Selection for high-yield of fibre	do.

(From the Horticultural Division, Peradeniya)

Peterpasand, a new varietv of Mango for the Low and Mid Wet Zones

Several varieties of mangoes were planted out at the Experiment Station, Peradeniya, during the years 1937–1941 in the New Orchard. Some of the varieties were imported from Bombay, Madras, Africa and Mauritius, while others were local and Jaffna varieties. Most of the varieties did not come into flowering or fruit until 1946. Some flowered but did not set any fruit. The only variety that flowered and fruited consistently under the wet zone conditions that prevail at Peradeniya was Peterpasand. In 1949, it fruited twice, once in February and again in July. In 1950 it was the only one amongst the varieties of mangoes that gave a satisfactory crop in June-July. In January 1951 it flowered but was the only variety that set fruit though some other varieteis flowered without setting fruit.

From the performance of individual trees of this variety during the last five years there is every likelihood of its suitability for the wet zone. Though small the quality of fruit is somewhat similar to the " Chembatan " variety of Jaffna. It is a variety that flowers and sets fruit consistently each year. Unseasonal rain does not appear to affect adversely the setting of fruit of this variety to the same extent as in the case of other varieties including the *Gira* (Parrot) which is the local variety most suited to the mid wet zone.

(From the Tobacco Division)

Cigarette Tobacco Trials in Jaffna

Considering the fast-declining demand for Jaffna chewing tobacco in the Travancore market, its main outlet, trials were laid out in the Peninsula with Harrison's Special Cigarette Tobacco, with a view to ascertaining the possibilities of introducing this variety to replace the uneconomic local chewing types.

Peterpasand. An eight-year old bud-graft.

Preliminary trials were carried out in Maha 1949/50 at the following centres :—

Valigamam North,
Valigamam East,
Point Pedro,
Sudumalai,
Thenmaradchy,
Jaffna Farm School,
Mathagal.

The trials were conducted with the co-operation of cultivators on their own lands, except at Jaffna Farm School and Mathagal. The green leaf from cultivators was purchased at 18 cents per lb. Grade 1 and at 8 cents per lb. Grade 2. The money for the purchase of green leaf was advanced by the Ceylon Tobacco Company, Ltd. The Green Leaf was cured by the Department and handed over to the Ceylon Tobacco Company for carrying out manufacturing tests. The Ceylon Tobacco Company reported that the leaf produced from Valigamam North, Valigamam East and Thenmaradchy had the desired burning qualities.

Hence during 1950/51, field scale trials were carried out at the above three centres and at Sanguvely. 16½ acres were cultivated as follows :—

Valigamam North	—	4½ acres.
Valigamam East	—	6¾ acres.
Thenmaradchy	—	4¼ acres.
Sanguvely	—	1 acre.

The green leaf from cultivators was bought and cured by the Department of Agriculture in flue-curing barns at Jaffna Farm School and Vembiray.

For the total extent of 16½ acres the average yield per acre of green leaf was 9,406 lb. This crop fetched an average value of Rs. 1,701·91 per acre.

The income realized from cigarette tobacco cultivation compares very favourably with the returns obtained from local chewing tobacco. Thus in a number of areas in the Peninsula the Jaffna tobacco farmer has in cigarette tobacco an alternate economic crop to chewing tobacco.

Meetings and Conferences

PROCEEDINGS OF THE TENTH MEETING OF THE CENTRAL BOARD OF AGRICULTURE, HELD IN THE BOARD ROOM AT THE ROYAL BOTANIC GARDENS, PERADENIYA, ON JUNE 11, 1951, AT 2 P.M.

Dr. A. W. R. Joachim, Director of Agriculture, could not preside owing to illness, and Mr. C. N. E. J. de Mel (Deputy Director of Agriculture), was elected Chairman *pro tem*, and the following were present:—Dr. W. R. C. Paul (Assistant Director (Technical)); Mr. P. B. Bandaranayake; Mr. S. L. Bandara Dharmakirti, J.P.; Mr. A. L. Johnpulle (Divisional Agricultural Officer, Uva); Mr. D. B. Ellepola (Acting Director, Rural Development); Mr. S. B. Yatawara (Deputy Registrar of Co-operative Societies); Mr. A. M. Clement Dias; Sir Wilfred de Soysa; Mr. U. B. Unamboowe; A. E. Madawala Dissawa; Mr. A. Hensman; Mr. R. T. Chelliah; Rev. Fr. L. W. Wickremasinghe; T. B. Poholiyadde Dissawa; Mr. W. T. I. Alagaratnam (representing the Director of Irrigation); Mr. S. Sivapalan, M.P.; Mr. W. M. Cumaraswamy; Sir James P. Obeysekera; Mr. H. Abeyagoonasekera; Mr. Chas A. M. de Silva and Mr. R. L. Arnolda, C.C.S. (Secretary, Central Board of Agriculture).

Letters and telegrams regretting inability to attend the meeting were received from the following:—Gate Mudaliyar M. S. Kariapper, M.P., Director of Irrigation; Major E. C. de Fonseka, M.B.E., E.D.; Mr. E. Abeyratne (Agricultural Research Officer, Maha Illuppalama); Director, Coconut Research Scheme; Director, Rubber Research Scheme; Mr. A. Perumynar; Mr. R. H. Spencer Schrader; Mr. Thomas Amarasuriya (Chairman, Low-country Products Association); Mr. W. P. A. Wickremasinghe, M.P.; Senator Justin Kotelawala; Mudaliyar N. M. Abulcassim Maraikar; Senator C. Wijesinghe; Mr. Marcus S. Rockwood; Mr. E. Muttukumaru; and Mr. U. B. Dedigama, R.M.

I. CONFIRMATION OF THE MINUTES OF THE LAST MEETING

The minutes of the 9th meeting of the Central Board of Agriculture were unanimously confirmed as correct.

II. TABLE LETTER FROM THE MINISTRY OF TRANSPORT AND WORKS REGARDING CONCESSIONARY FARES ON THE RAILWAY FOR COLONISTS AND AGRICULTURAL LABOURERS

The letter from the Ministry of Transport was to the effect that it was regretted that the Ministry was not prepared to re-introduce that concession particularly in view of the fact that the Railway was at present incurring heavy losses owing to rising costs of operation. The Board decided to take no further action on the matter.

III. TABLE LETTER FROM THE MINISTRY OF AGRICULTURE AND LANDS REGARDING ACTION TAKEN ON RESOLUTIONS PASSED BY THE BOARD CONCERNING

(*a*) Animal Diseases.
(*b*) Appreciation of work done by Government Departments.
(*c*) Veterinary Hospitals.
(*d*) Appreciation of Mr. Rhind's services.

(*a*) The Permanent Secretary to the Ministry of Agriculture and Lands by his letter No. BA. 1335 of May 10, 1951, had requested the Permanent Secretary to the Ministry of Home Affairs and Rural Development, that as section 4 of the Disease of Animals Ordinance,

No. 25 of 1909 (Chapter 327) required that proclamations regarding Disease of Animals should be made by Government Agents or Chief Headmen, Revenue Officers be requested to give publicity to outbreaks of animal diseases in the *Government Gazette* and Press.

(*b*) The Ministry of Agriculture and Lands has forwarded copies of this resolution to the respective departments for their information.

(*c*) The Director of Agriculture has been instructed by the Permanent Secretary to the Ministry of Agriculture and Lands to take action on this resolution, and the matter is receiving attention.

(*d*) A copy of the resolution passed by the Board in appreciation of Mr. Rhind's services has been forwarded to Mr. Rhind by the Ministry of Agriculture and Lands.

IV. TABLE MEMORANDUM SUBMITTED BY THE DIRECTOR *RE* " ALL CEYLON EXHIBITION FUND "

Copies of this memorandum were circulated among members and the ensuing discussions followed.

Sir James P. Obeysekera expressed the view that the sum of money suggested to be credited to revenue was collected from the public. Therefore he observed that Government had no right to credit it to revenue but instead it should be placed in deposit in the name of the Board for the purpose it is intended. He also added that the interest on the sum had been added only up to September 27, 1950, and desired that interest on the amount be added up to date.

Mr. D. B. Ellepola, Acting Director, Rural Development, stated that that sum was made up of two contributions. At the end of that Exhibition the sum of money taken from Government was refunded. In the year 1945 there had been an exhibition which had resulted in a loss. Even that loss had been recovered out of this fund. He therefore felt that no portion of that money could be taken as belonging to Government and that it was completely outside Government funds.

Regarding the question of the Government undertaking to finance future exhibitions, he said that that was a matter which was entirely decided on other grounds. It became the policy of Government to improve agriculture and in accordance with that policy the Government had decided that any future exhibition should be run out of State funds under separate accounts. He added that he did not think that the Board should give up what funds it had to the Treasury. He personally did not see what objection the Treasury should have to the Board utilizing that money for similar purposes.

Mr. Clement Dias, endorsing the views of the earlier speakers, emphasized the necessity for holding such shows for the agricultural prosperity of the Island. He also added that shows in Ceylon were very small compared to those held in other countries like Germany where the show grounds extended up to 90 acres or even more. He emphasized the necessity of holding large-scale All-Island Shows, if not yearly, at least once in two years, and that the Government should finance such shows.

At this stage the Chairman stated that if the Board so desired, a member should move a resolution that that money be reserved for the use of the Board.

A. E. Madawala Dissawa proposed " That the money in the name of the All-Ceylon Exhibition Fund, vested in the Standing Committee appointed by the Central Board of Agriculture, which was placed in fixed deposit with the Treasury, be utilized for purposes of the Central Board of Agriculture."

Mr. A. M. Clement Dias seconded this resolution.

V. RESOLUTIONS TO BE MOVED

Mr. U. B. Unamboowe moved the following resolution:—

" The Central Board of Agriculture recommends to Government that investigations be made by a competent officer to find out whether it is possible to divert water from the Mahaweliganga at a suitable point to augment the supply of water in the tanks of the Matale and Anuradhapura districts."

Mr. Unamboowe said that this was a very simple request. He was only asking the Irrigation Department to investigate that question and see whether it was possible to divert the water of the Mahaweli Ganga to lower elevations. He added that the Mahaweli Ganga starts from the hills of the central portion of the Island and all that water enters the sea, and desired that investigations be made whether that water could not be put to better use. He said that when the biggest rainfall is recorded from the south-west monsoon in one part of the country, the dry zone gets no rain at all. He therefore felt that it would be a great service if Government could divert the excess water flowing through the Mahaweli for purposes of irrigation. He said that most of the members of the Board would be aware of the conditions that existed in the North-Central Province, about 25 or 30 years ago. The first scheme that was inaugurated by Government was the Minneriya Scheme. That Scheme was made a success under very difficult circumstances. Thereafter so many other schemes had been inaugurated and a large number of people from different parts of the Island had now gone to the North-Central Province to reside. Besides the water that is required for cultivation purposes, people in this area sometimes suffered for lack of water for their own needs. He hoped that as those schemes grew in importance, more and more people would go into residence in that part of the country. At present the people of the North-Central Province depended on the tanks for all their requirements of water, and that was dependent on the rainfall from the north-east monsoon. During the last year or the year before, rains did not come down at the proper time and as a result all the tanks went dry, causing a great deal of hardship to the people. He emphasized that there should be no reason at all why the waters of the Mahaweliganga should not be diverted for the use of those people. He reiterated that he was only requesting that investigations be made by the Irrigation Department to see whether that water could not be diverted. If that was a possibility, extensive tracts of paddy land from Matale going further north would be benefitted which usually remain uncultivated during the South West monsoon. As an example he said he would like to mention that during the time of the construction of the Railway from Rambukkana to Bandarawela, they had come across several obstacles and various difficulties and they had to bore through several hills before the construction of the line to Bandarawela was a possibility. With all the difficulties, that was a success. He said he was only asking the simple question whether it was not possible to divert water from the Mahaweli Ganga to lower elevations.

In conclusion he said that if an officer was especially appointed for that purpose, those who were interested in that project could submit their views to him. He therefore requested that an officer be detailed for that investigation.

Mr. R. T. Chelliah seconded the resolution with an amendment to the original resolution with the permission of the mover, viz.: " ..... to augment the supply of water in the tanks of the Matale and Anuradhapura districts and any other districts possible."

The mover and the Board agreed to this amendment and the amended resolution read as follows:—" The Central Board of Agriculture recommends to Government that investigations be made by a competent officer to find out whether it is possible to divert water from the Mahaweli Ganga at a suitable point to augment the supply of water in the tanks of the Matale and Anuradhapura districts and any other districts possible."

Mr. R. T. Chelliah emphatically inquired why such a scheme should benefit only the Anuradhapura and the Matale districts. He said that it was very essential that the maximum benefit should be derived from such a scheme and therefore it should be extended to other districts as well. He added that Government had investigated that matter some years ago and that some experts from India were employed for the purpose. Their investigations had revealed that it was possible to divert the water of the Mahaweli Ganga for purposes of irrigation not only Anuradhapura and Matale districts but even the Northern Province. He said that this flow of water which comes down from the hills carry with it valuable manure as well. He stressed the value of this project and said that if this water could be stored in tanks in various districts to benefit irrigation as was done in the days of the ancient kings, cultivation of crops would be facilitated to a great extent. In conclusion he said that it would be helpful if the representative of the Director of Irrigation could enlighten them on the subject.

Rev. Fr. Wickremasinghe in supporting the resolution said that it was surprising that although Ceylon was prolific with rivers running north and south yet a large part of the Island suffered without water even for drinking. He said that there was another resolution by Mr. Wickremasinghe for the diversion of surplus water of the Nilwala Ganga to the Dry Zone. He hoped that these schemes if implemented would not only help the irrigation of the whole Island but would also ensure to the whole Island a sufficient supply of water for drinking purposes. He said he knew of certain large villages in which the people have no water for drinking. Sometimes they were forced to squeeze mud and obtain a little water for drinking. He felt that it would be very feasible if a survey could be made with the hope of providing water to different parts of the Island. He said that instead of resuming the work of the Nilwala Ganga flood protection work it was essential to protect the people from suffering during the drought without water for drinking. Fr. Wickremasinghe therefore suggested that both these resolutions should be amalgamated into one urging that investigations be carried out on all rivers of the Island whether they could not be diverted at suitable points where there was enough water. He requested that the Deputy Director of Irrigation who was present be asked to enlighten the Board on the matter.

The Chairman at this stage said that the resolution to which Rev. Father Wickremasinghe had made reference was postponed at the request of Mr. Wickremasinghe as he was unable to be present. Unless the mover's permission was obtained for its discussion in his absence and without prior notice, the Chairman felt that it was not in order to speak on Mr. Wickremasinghe's resolution.

Poholiadde Dissawa speaking next, said that during the last 15 years it has been a common occurrence to have a drought once in 3 years. He believed that the Deputy Director of Irrigation would be able to tell them the large sums of money spent for the storage of water for irrigation purposes. For that water the country had to depend on rains. Therefore if by some means or other the Mahaweli Ganga water could be dammed, then there was a possibility of supplying water to a very large number of the existing tanks some of which are in ruins today, up to Elephant Pass. He believed that with Kalawewa on one side and the Huruluova on the other side, water could be made to run all over the district. He said that if once in 3 years as much as 5 lakhs of rupees could be spent on relief work he could not see why a substantial amount should not be spent on a scheme as the one suggested, the benefits of which are many. At present the North-Central Province, which is one of the biggest paddy producing areas, had to depend only on rain water for their cultivation and other needs. In conclusion he said that if the anticipated expenditure on a scheme of this nature was calculated along with the large sums of money spent on relief work, it would be realized that it is far more beneficial to complete a scheme of this nature than incur periodical expenditure ranging to large sums.

The Deputy Director of Irrigation read the following memorandum containing the observations of the Irrigation Department on the resolution:—

Diversion of Water from the Mahaweli Ganga to the Anuradhapura District

In general there are two methods of transferring water from one basin to another. The first is by means of an open channel taken down the dividing ridge, or through a saddle between the two basins. This is frequently done in irrigation works as, for example, in the Elahera, Giritale, Minneri irrigation systems. The second method is the connection of two suitable points, one on each drainage line, by means of a tunnel. This has been adopted mostly in hydro-electric schemes as, e.g., at Norton Bridge.

In the case under consideration, the first method does not appear to be feasible. From an examination of the topo maps there appears to be a feasible route of diversion using two sections of tunnels. The route though feasible topographically, may or may not be feasible from the geological conditions that exist.

The route of the proposed tunnels and improved waterways is shown on the topo sheets 1.25, 1.20, 1.15, 1.10 and 1.5. A ridge at elevations varying from 1,700 to 2,000 ft. divides the Mahaweli and Sudu Ganga basins between Katugastota and Wattegama. The level of the P. W. D. bridge at Katugastota, one mile above the point of diversion 1/20

(8.15 × 0.25), is about 1470 M. S. L. The river bed level at the point of diversion will be about 1,400. The level of the drainage line at Yatawara 1/20 (10.1 × 3.0), in the Sudu Ganga basin is about 1,300. The direct distance between these two points is about 3.5 miles. Therefore it can be seen that a possibility exists for a diversion of a part of the Mahaweli Ganga flow into the Sudu Ganga.

The Sudu Ganga finally discharges via the Ambanganga back into the Mahaweli Ganga near Manampitiya. Therefore, to take the water further north it is necessary to dam the Sudu Ganga and to carry the water through the intervening ridge into the Kalawewa basin. This can be done by one of two methods—

A. (i) An anicut can be constructed across the Ambanganga at Akarahaduwa 1/10 (9.1 × 4.85) and the water carried in an open contour channel across the Nalanda Oya to Uswettawa 1/10 (9.35 × 6.05), at an elevation of about 800.

(ii) From here a tunnel can pass the water under the dividing ridge and drop it into the Dambulle Oya at Kuruwekotuwe Wewa 1/5 (10.2 × 2.55). The elevation here is about 750 and the length of the tunnel required is approximately *5.5 miles*.

B. Instead of constructing an anicut a tank can be built by an embankment at 1/10 (9.7 × 5.6), above the Bowatenne anicut. The water can be drawn up from the periphery of the reservoir so formed and passed into the tunnel as described at A (ii) above.

The length of the river section along which the water will have to flow is 26 miles up to the intake into the second tunnel. In this reach there are 7 anicut schemes that have been constructed by the Irrigation Department. Various stretches of cultivated land lie on either side of this stream.

First Tunnel.—The length of the tunnel will be 3.5 miles at a velocity of 8 ft. per second. The discharge capacity of various sizes of circular tunnel is as follows:—

10 ft. dia. — 600 cusecs.
20 ft. dia. — 2,500 cusecs.
30 ft. dia. — 5,700 cusecs.

The maximum overburden for this tunnel will be about 500 ft. A certain section at the beginning may have to be carried as an open lined channel, in which case the length of the tunnel will be shortened to about 3 miles. In the Yatawara end of the tunnel there is a steep drop in ground level to the drainage line. It may be possible to utilize this drop for the production of hydro-electric power.

Second Tunnel.—The length of this tunnel will be approximately 5.5 miles. The maximum overburden will be about 550 ft. at the Karawilahena ridge.

Water can be conveyed further north from the Dambulle Oya by a reconstruction of the abandoned Yoda Ela extending northwards from Wellahena F/25 (6.9 × 1.1), and then possibly via the old Kandalamayodaela into the Malwattuoya catchment.

Further investigation required.—Before making any definite proposals much investigation has to be done.

(*a*) The water resources of the Mahaweli basin should be analysed and plans for their economic utilization drawn up.

(*b*) The needs of the existing lands cultivated from the Mahaweli Ganga, e.g., the Allai Scheme and the Minipe Scheme, should be looked into.

(*c*) Detailed surveys, both surface and sub-surface, are required along the tunnel sections, and the waterways that will be traversed by the diverted water. The borings for the tunnel locations will extend from 500—600 ft. below surface in some instances.

(*d*) The suitability of existing structures along the Sudu Ganga to pass the increased discharge should be investigated.

Hydrology.—The area of the Mahaweli basin above Tennakumbura where there is a gauge station is 547 sq. miles. The site of the diversion is 4 miles above Tennakumbura. Gaugings are available of the flow past this station for 5 years. These are as follows:—

	1944–45	*1945–46*	*1946–47*	*1947–48*	*1948–49*	*1949–50*
October	4,500	4,600	3,300	3,800	2,100	3,900
November	5,800	4,700	5,000	700	1,700	3,500
December	4,700	4,100	8,000	900	2,300	3,800
January	650	1,500	5,000	900	1,800	2,200
February	600	800	1,700	90	500	1,800
March	500	1,200	2,200	800	700	2,200
April	100	2,500	2,100	900	1,400	1,500
May	500	800	1,200	1,100	2,000	3,000
June	2,700	2,200	2,100	5,000	4,300	4,500
July	1,400	4,900	2,500	4,700	4,600	6,200
August	3,100	5,600	14,000	1,200	4,700	5,000
September	1,600	4,000	2,000	600	4,200	7,600

The average rainfall of 3 representative stations in the catchment are given below:—

	Hatton	*Onagaloya*	*Orwell*
September	13·46	17·25	8·93
October	13·80	18·62	16·59
November	10·09	14·73	14·20
December	5·96	7·27	7·75
January	4·47	5·63	6·30
February	2·65	2·63	2·35
March	6·56	6·30	6·92
April	9·07	9·90	9·93
May	14·75	16·30	11·44
June	21·41	25·33	12·12
July	21·39	22·25	9·84
August	15·50	18·20	7·97
	140·01	164·41	113·74

Hydro data for Kalawewa.—

Capacity : 72,600 acre ft.
Full supply area : 6,380 acres.
F. S. L. : 420 R.L.
Sill of Sluices : 390, 394, 399.
Discharge at maximum supply : 433, 200, 176 (say) 800 cusecs.

Action has already been taken to divert part of the Mahaweli Ganga flow into N. C. P. by the construction of the Nalanda Oya Reservoir which is in progress. In this instance it is proposed to divert about 30,000 ac. ft. from the Nalanda Oya, a tributary of the Mahaweli Ganga into Kalawewa.

The Deputy Director of Irrigation added that the department was already studying the possibilities of the Mahaweli Ganga basin and that already some investigations have been done. The most important aspect of the matter was the economic study of a scheme and said that he was not aware how long such a study would take. It is possible to divert the Mahaweli Ganga north to Jaffna or south to Hambantota as the levels will permit it. But these ventures could be started only if they are economical. The possibility of the use of the Mahaweli Ganga water in its own basin should first be investigated, and only if after satisfying the needs of that basin surplus water was still available, attempts should be made to divert the flow to other catchments, as the diversion, construction of long channels and big reservoirs will be very expensive.

He added that a previous speaker had mentioned that if the Railway was constructed from Rambukkana to Bandarawela cutting through several hills, he did not see what difficulty there was in constructing a channel from the Mahaweli Ganga. He said that the Railway could run up a hill or down a valley whereas a channel

had to always go down and down. To divert the flow of Mahaweli Ganga a small channel would not do. To carry the flood discharge, very big channels would be necessary, and also the construction of very big reservoirs was necessary for storing the water for use during the drought period. The question of the possibilities of the river basins in Ceylon are being studied by the department, and it is not possible at present to say what the final proposals will be and how long the construction will take.

Mr. D. B. Ellepola, Acting Director, Rural Development, said that he could recollect having sent a proposal made by a certain gentleman somewhere in 1939 to the Irrigation Department to investigate the possibility of tapping the Mahaweli Ganga near about Kandy and diverting the water to Galagedera pass. At that time the cost being very prohibitive much attention had not been paid to the suggestion. He requested the Director of Irrigation to see whether any such scheme had been investigated.

Mr. U. B. Unamboowe said again that his request was a very simple one. He merely asked that an officer be appointed to investigate the possibilities of such a scheme. The officer who is appointed should be allowed to call for representations if necessary. He also requested that this matter be expedited.

The Chairman said that the Deputy Director of Irrigation in his memorandum as well as in his remarks had indicated that there are possibilities of doing certain things to effect a scheme as desired. But Mr. Unamboowe desired that a special officer be appointed for the purpose of investigating such possibilities. He therefore felt that the resolution should be sent to the Ministry along with a copy of the minutes for suitable action.

Mr. Clement Dias, supporting Mr. Unamboowe's request, said that at the present day there was a tendency in most departments for old officers to oppose whatever schemes were put forward by young officers, however feasible they might be. Mr. Unamboowe's resolution called for an officer to be appointed for the purpose of investigating the possibilities of such a scheme so that the dry zone might be irrigated by the waters of the Mahaweli Ganga. He added that in Ceylon the maximum rainfall was about 200″ and the lowest was about 50″, whereas countries receiving as little as 10″ rainfall were doing better than Ceylon. In regard to the question of economy raised by the Deputy Director of Irrigation, he said that the Government had plenty of money and there was no reason why something of it should not be spent on a scheme of that nature.

Mr. S. Sivapalan, M.P., said that what was required was an investigation of the scheme. The idea behind the mover in asking for the appointment of a special officer for the purpose, was that the full scheme be implemented with the least possible delay. He believed that there was no harm in passing that resolution and conveying to the Minister the desirability of detailing a special officer for that work with particular reference to the possibility of making use of the water that is going waste in the Mahaweli Ganga for the benefit of the areas that require it most.

VI. RESOLUTION TO BE MOVED BY MR. W. P. A. WICKREMASINGHE:—

" This Board recommends to the Hon. The Minister for Agriculture & Lands to institute an investigation on the possibility of diverting the surplus water of the Nilwala Ganga to the Dry Zone of the Hambantota District before resuming the work of the Nilwala Ganga Flood Protection Scheme."

In the absence of the mover, this resolution was postponed.

VII. RESOLUTION TO BE MOVED BY GATE MUDALIYAR N. WICKREMARATNE:—

" In order to encourage production of more food from the existing paddy fields and also in certain cases to protect paddy fields from disuse as paddy fields by silting, that immediate steps should be taken by Government to preserve and restore pita elas and wanathas bordering tea and rubber lands in the Up-country Districts in the Island."

In the absence of the mover, this resolution was postponed.

VIII. RESOLUTION TO BE MOVED BY MR. R. H. SPENCER SCHRADER:—

"It is the opinion of this Board that the minutes of meetings, as at present recorded, are inordinately long, and that, in future, the minutes should contain only a precis of the more important points raised in debate and the decisions reached."

This resolution was also postponed in the absence of the mover.

IX. TABLE REPORT OF SUB-COMMITTEE APPOINTED BY THE BOARD TO REPORT ON THE RESOLUTIONS REGARDING CROP AND CATTLE INSURANCE

The Chairman said that he, as Chairman of the Sub-Committee, had been asked to inform the Board that the Sub-Committee was not ready with the report and that it was hoped to submit the report at the next meeting of the Board, if everything went well.

X. ANY OTHER BUSINESS

Mr. A. M. Clement Dias informed the Chairman that 1,500 or 2,000 ft. of cine-photos were available with him and that if the Board wished, he could arrange a show at the next meeting, to last about 40 minutes.

The Chairman and the Board agreed to this suggestion.

The meeting terminated at 3.15 p.m.

R. L. Arnolda,
Secretary,
Central Board of Agriculture

Peradeniya,
June 18, 1951.

Rubber Research Scheme (Ceylon)

MINUTES OF THE 108TH MEETING OF THE RUBBER RESEARCH BOARD HELD AT THE PLANTERS' ASSOCIATION HEADQUARTERS, COLOMBO, AT 2.30 P.M. ON MONDAY AUGUST 20, 1951

Present.—Mr. F. H. Griffith (in the Chair), Dr. A. W. R. Joachim (Director of Agriculture), Major T. F. Jayawardena, M.P., Mr. R. J. Hartley, Mr. F. A. Obeyesekera, Mr. J. L. D. Peiris, Senator C. Wijesinghe and Dr. H. E. Young (Acting Director).

Mr. R. H. Wickremesinghe (Controller of Establishments), had expressed his inability to attend.

1. MINUTES

Draft minutes of the meeting held on May 29, 1951, which had been circulated to members, were confirmed and signed by the Chairman.

2. BOARD

The following changes in membership were reported :—

(*a*) Mr. F. H. Griffith had resumed his seat with effect from August 10 relieving Mr. W. A. Paterson who had been acting for him.

(*b*) Major T. F. Jayawardena, M.P., had been nominated by the Minister of Agriculture and Lands to act for Major Montague Jayewickreme, M.P., with effect from July 2.

(*c*) Mr. Francis Amarasuriya had resumed his seat on his return to the island relieving Mr. D. E. Hettiaratchie.

3. EXPERIMENTAL COMMITTEE

Recommendations of the Committee—

Tenders for buildings.—The Committee's recommendations regarding the acceptance of the tenders of a certain contractor for the construction of a Staff Club House, 2 Intermediate Staff bungalows, 2 Junior Staff bungalows and 12 labourers' cottages were approved.

4. DECISION BY CIRCULATION OF PAPERS

Appointment of a Clerk-Librarian.—It was reported that members had approved the appointment of a Clerk-Librarian on the proposed salary scale.

5. REPORTS AND ACCOUNTS

(*a*) *Investments.*—The investment of Rs. 500,000 in the new 3 per cent. State Loan was reported.

(*b*) *Statement of Receipts and Payments for the 1st Quarter 1951*—was approved.

(*c*) *Purchase of Jeep.*—The purchase of a jeep and trailer in accordance with an earlier decision of the Board was reported.

6. CLEARING FOREST LAND AT HEDIGALLA

Contracts awarded to two contractors for felling and clearing 75 acres of forest land at Hedigalla for 1952 planting were reported.

7. STAFF

(*a*) *Director.*—The appointment of a Director was considered and left over for final decision at a full meeting of the Board.

(*b*) *Secretary-Accountant.*—It was reported that Mr. C. D. de Fonseka, Secretary-Accountant, had resumed duties on August 17, on the expiration of his end-of-contract leave.

(*c*) *Acting Assistant Mycologist.*—It was reported that Mr. D. M. Fernando, Acting Assistant Mycologist, had been awarded a two-year scholarship by the Canadian Government under the plan for technical aid to S. E. Asia, and had left Ceylon by air on July 27.

(*d*) *Junior Staff.*—Changes in junior staff since the last meeting were reported.

8. LONDON ADVISORY COMMITTEE

(*a*) *Report for 1949 and 1950* (*C. P. No. 1624*)—was tabled.

(*b*) *Minutes of the 51st and 52nd meetings of the Committee and Technical Sub-Committee*—were tabled.

9. DISTRIBUTION OF BUDWOOD OF CLONE LCB. 1320

It was reported that the Indonesian Government had appointed the Scheme as its official agents for the distribution of budwood of clone LCB. 1320. Arrangements had been made for importation of budwood of this clone direct from Java for establishment in the Scheme's nurseries for experimental and distribution purposes.

10. SALE OF BUDWOOD OF R. R. I. M. CLONES TO SMALLHOLDERS

A request for purchase of budwood of clone R. R. I. M. 501 by a smallholder was reported and it was agreed that budwood of this clone be sold to smallholders at half the usual price, i.e., Rs. 3·50 per yard subject to signature of the usual sales agreement.

11. MR. CONSTABLE'S SERVICES FOR COCOA INDUSTRY

A letter from the Planters' Association of Ceylon enquiring whether the services of Mr. Constable, Agronomist, could be made available in an advisory capacity for cocoa planting was considered. It was agreed that Mr. Constable's services could not be spared in an advisory capacity but he may serve on the Department of Agriculture Committee which deals with cocoa planting.

12. MANURIAL EXPERIMENTS

Proposed arrangements for laying out manurial trials on estates were approved.

The meeting then terminated.

Dartonfield,
Agalawatta, August 30, 1951.

C. D. DE FONSEKA,
Secretary-Accountant.

MINUTES OF THE MEETING OF THE BOARD OF THE TEA RESEARCH INSTITUTE OF CEYLON HELD AT 2.30 P.M. ON FRIDAY, APRIL 20, 1951, AT THE OFFICES OF THE PLANTERS' ASSOCIATION OF CEYLON, 113, STEUART PLACE, COLPETTY, COLOMBO.

Present.—Mr. R. C. Scott, C.B.E. (Chairman), The Director of Agriculture (Dr.A.W.R. Joachim, M.B.E.), The Chairman, Planters' Association of Ceylon (Mr. R. C. L. Notley), The Chairman, Agency Section, Planters' Association of Ceylon (Mr. R. S. Davies), Messrs. V. G. W. Ratnayake, M.B.E., M.P., Errol Jayawickreme, W. Neal de Alwis, J.P., U.M., W. H. Attfield, A. D. McLeod, R. M. Macintyre and J. Lamb (Director and Secretary).

1. NOTICE CONVENING THE MEETING WAS READ

Letters regretting inability to attend the meeting were received from Messrs. L. B. de Mel, A. G. Ranasinha, C.M.G., C.B.E., C.C.S., H. S. Hurst and H. de T. Wilkinson Kay.

2. The Minutes of the meeting of the Board held on February 14, 1951, were confirmed without comment.

3. MEMBERSHIP OF THE BOARD AND COMMITTEES

(*a*) *Board.*—

The Chairman reported :

(i) That Mr. J. C. Kelly had resigned his seat on the Board as from March 31, 1951, on his retirement from Ceylon. In expressing the appreciation of the Board the Chairman quoted a letter he had written to the Secretary of the Planters' Association of Ceylon (Agency Section) on receipt of the official intimation of Mr. Kelly's retirement.

He referred to the serious operation on his eye which Mr. Kelly had to undergo and expressed the hope that it would be entirely successful, and that he would soon regain full health and enjoy a long and happy span of retirement.

(ii) That Mr. R. Singleton Salmon, C.B.E., had also resigned his seat as from March 31, 1951. On behalf of the Board he expressed the thanks of the Board to Mr. Singleton Salmon for his services to the Tea Research Institute.

Messrs. R. N. Macintyre and A. D. McLeod, nominated by the Agency Section of the Planters' Association of Ceylon to fill the places rendered vacant by the two resignations, were welcomed to the Board.

(iii) That the three members representing the Low-Country Products Association, viz., Messrs. W. Neal de Alwis, J.P., U.M., Leo B. de Mel, J.P., U.M., and Errol Jayawickreme had been re-nominated by the Low-Country Products Association as from February 6, 1951.

He expressed pleasure at the renomination of these three members to the Board and expressed the hope that Mr. de Mel would make a quick and complete recovery from his recent illness.

3—J. N. B 10371 (9/51)

The Board congratulated Dr. A. W. R. Joachim on his appointment as Director of Agriculture.

(*b*) *Finance Sub-Committee.*—

The resignations of Messrs. J. C. Kelly and R. Singleton Salmon had created two vacancies on the above Committee. The Chairman proposed the election of Dr. A. W. R. Joachim as one member. Agreed.

Mr. R. C. L. Notley proposed and Mr. V. G. W. Ratnayake seconded that that Mr. W. H. Attfield be elected as the other member. Accepted.

(*c*) *Estate and Experimental Sub-Committee.*—

Messrs. R. H. Horne and G. K. Newton were proceeding on leave, they had both expressed their desire to continue on the committee. Mr. T. Kane had agreed to act for Mr. Horne as on previous occasions.

The Chairman referred to Mr. Horne's recent serious indisposition and hoped that he too would make a speedy return to normal health.

4. SMALL HOLDINGS

(*a*) The Chairman briefly reviewed the steps taken by the Sub-Committee which the Board had set up at the meeting held on October 18, 1950, and referred to the circular letter dated March 1, 1951, which conveyed the decision of this Sub-Committee. All members of the Board had agreed to the proposal to ask for an increase in the Tea Research Cess by 5 cents, i.e., from 25 cents to 30 cents per 100 lb. tea exported. He said that copies of the letter addressed to the Honourable the Minister of Agriculture and Lands dated March 6, together with a report on the small holdings advisory service had been issued to members. He asked members for approval of the action taken. Approved.

(*b*) It was necessary for the Board to appoint a Sub-Committee to select the new Small Holdings Officer for the Kotmale area. Applications were to close on April 20, and 185 applications had been received up to April 19.

Mr. V. G. W. Ratnayake not being available, Dr. A. W. R. Joachim, Mr. Errol Jayawickreme and Mr. R. C. L. Notley with the Director as convener were elected to form the Sub-Committee.

(*c*) There was a considerable demand by small holders for tea seed in small quantities. Last year the Department of Agriculture has subsidized seed imported from Malaya, but this year it was proposed to sell the seed to small holders at cost price so that the Institute would not be involved in any loss.

5. STAFF

(*i*) *Grading Scheme.*—

The Chairman explained that the loss of the services of senior officers in recent years had resulted in the Junior Staff having to carry more responsibility. Several promotions had already been made where ability to carry responsibility had been demonstrated. Authority must, however, be given with responsibility and those carrying responsibility should receive adequate remuneration.

Without any radical changes it had been found possible to formulate a clear cut scheme of comparative simplicity.

(1) To Provide clearly defined scales to facilitate administration and new appointments and to remove anomalies without any unfairness to present staff;

(2) To Provide ample opportunity for promotion by upgrading with the object of encouraging the staff and preventing stagnation.

(3) To safeguard the Board's interests in the case of employees of limited ability.

Qualifications for new entrants should be—

Grade I—University degree or equivalent.

Grade II—S. S. C. or equivalent.

Grade III (Field)—J. S. C. or equivalent.

(*ii*) *Procedure for making appointments.*—

A letter had been received from Sir Ivor Jennings on the subject of procedure for making appointments.

The Chairman asked the Board to agree to constitute a Selection Committee on the lines set out by Sir Ivor Jennings, i.e., the Chairman of the Board, the Director of Agriculture and the Director of the Tea Research Institute, with one or two experts either from the Department of Agriculture or the University co-opted if necessary.

Dr. Joachim agreed to serve, and proposed that Sir Ivor Jennings, or his nominee, and a member of the Board, preferably one suited for the particular appointment should be appointed in place of the two experts suggested by Sir Ivor Jennings. This was agreed to, and it was also decided that the member of the Board should be selected by the Director in consultation with the Chairman.

6. ST. COOMBS ESTATE

The Chairman reported that Mr F. C. Daniel, the Superintendent, was expected to arrive in Colombo on April 22, 1951. He would take over from the Acting Superintendent on May 3, 1951.

He wished to record appreciation of the excellent work carried out by Mr. Bruce Gibbon, as a result of which St. Coombs Estate was in very fine condition. The Visiting Agent had borne testimony to this fact in his latest report.

7. JUNIOR STAFF PROVIDENT FUND

(*a*) The Chairman reported that copies of the minutes of the meeting of the Trustees held on August 14, 1950, together with the rules incorporating the amendments as recommended by the Trustees had been issued to members. Those rules would therefore need the approval of the Board in order to become operative.

It would interest members to know that the Fund has a membership of 50 which included all monthly paid officers on the Institute's staff. The total assets of the Fund at December 31, 1950, was Rs. 281,754·63.

The Board ratified the rules as amended by the Trustees, and expressed their thanks to Mr. Singleton Salmon for his assistance in getting the rules set out in such a satisfactory manner.

(*b*) *Trustees.*—

No stock-broker member of the Board being available, Messrs. V. G. W. Ratnayake and R. S. Davies were elected as Trustees.

8. ANY OTHER BUSINESS

(*a*) *Visit by the Minister of Agriculture and Lands.*—

The Chairman reported that the Honourable Mr. Dudley Senanayake, Minister of Agriculture and Lands, paid an official visit to the Institute on Thursday, March 29, 1951, Several members of the Board were present and a full day's programme gone through.

(*b*) *Crop Protection Courses.*—

The Director had arranged for courses of instruction on Crop Protection. These courses, which were being held at present, had to be decentralized owing to the large numbers attending. Over 250 had applied and it had been arranged to hold the courses at Radella, Darawella, Badulla and Kandy.

(*c*) *Agri-Horticultural Show.*—

The Institute had put up a display of spraying machinery and other items of interest at the Agri-Horticultural Show held in Nuwara Eliya during Easter week.

(*d*) *The Ceylon Planters' Society.*—

The Ceylon Planters' Society had made a request to the Tea Research Institute to hold a special field day on the morning of May 19, for the benefit of Planters attending the meeting of the Society, which was to be held at Radella in the afternoon of that day. The Director had agreed to co-operate.

(*e*) *Director's leave.*—

The Chairman formally proposed that the Director be granted six months leave from June 3, 1951. He explained that the Director had agreed to fly back in November in order to prepare the estimates for 1952, and to be present for the two further essential Board meetings. He would then return by air to continue his leave early in 1952. Approved.

The Board expressed their appreciation of the Director's services and wished him an enjoyable holiday.

It was agreed that Mr. G. B. Portsmouth be appointed to act for Mr. Lamb during his absence on leave.

Finally, the Chairman thanked the members of the Board for their assistance in dealing with the unusually lengthy agenda and the meeting closed with a vote of thanks to the Chair.

Tea Research Institute,
Talawakelle.

J. LAMB.

RETURNS, ETC.

SUMMARY OF OUTBREAKS OF SCHEDULED ANIMAL DISEASES WITHIN THE DOMINION OF CEYLON—MONTH ENDED JUNE 30, 1951

Province	Disease	Fresh cases during the month	Total number from the beginning of this calendar year to 30th June, 1951				Balance ill at end of month
			Cases	Deaths	Shot	Recoveries	
Western Province	Foot-and-mouth	—	25	—	—	25	—
	Rabies	—	5	5	—	—	—
Colombo Municipality	Foot-and-mouth	—	34	—	—	34	—
	Anthrax	1	7	7	—	—	—
	Tuberculosis	4	7	7	—	—	—
	Piroplasmosis	1	5	5	—	—	—
	Rabies	8	29	29	—	—	—
	Haemorrhagic septicaemia	—	1	1	—	—	—
Quarantine Station	Piroplasmosis	—	3	3	—	—	—
	Anthrax (in sheep and goats)	4	24	24	—	—	—
	Pluero-pneumonia (goats)	39	87	87	—	—	—
Northern Province	Rabies	3	7	—	7	—	—
	Pleuro-Pneumonia (goats)	—	38	38	—	—	—
	Anthrax	—	6	6	—	—	—
	Foot-and-mouth	—	11	—	1	10	—
	Black Quarter	258	258	258	—	—	—
North-Central Province	Foot-and-mouth	—	718	—	—	588	130
North-Western Province	Rabies	—	2	—	2	—	—
	Foot-and-mouth	—	49	2	—	47	—
	Blackquarter	—	3	3	—	—	—
Central Province	Mange (cattle)	41	156	8	—	107	41
	Foot-and-mouth	—	348	1	—	347	—
	Piroplasmosis	—	1	—	—	1	—
	Black Quarter	—	14	14	—	—	—
Sabaragamuwa Province	Rabies	1	4	—	4	—	—
	Anaplasmosis	1	—	—	—	1	—
Uva Province	Black quarter	—	11	11	—	—	—
	Rabies	1	6	3	3	—	—
Eastern Province ..	Rabies ..	1	5	1	4	—	—
Southern Province ..	Anaplasmosis ..	—	1	—	—	1	—

T. M. Z. MAHAMOOTH,
Deputy Director (Animal Husbandry),
and Government Veterinary Surgeon.

Peradeniya, CEYLON,
July 24, 1951.

SUMMARY OF OUTBREAKS OF SCHEDULED ANIMAL DISEASES WITHIN THE DOMINION OF CEYLON—MONTH ENDED JULY 31, 1951

Province	Disease	Fresh cases during the month	Total number from the beginning of this calendar year to July 31, 1951				Balance ill at end of month
			Cases	Deaths	Shot	Recoveries	
Western Province	Foot-and-mouth	—	25	—	—	25	—
	Rabies	—	5	5	—	—	—
Colombo Municipality	Foot-and-mouth	—	34	—	—	34	—
	Anthrax	—	7	7	—	—	—
	Tuberculosis	1	8	8	—	—	—
	Piroplasmosis	1	6	6	—	—	—
	Rabies	4	33	33	—	—	—
	Haemorrhagic Septicaemia	—	1	1	—	—	—
Quarantine Station	Piroplasmosis	—	3	3			
	Anthrax (in sheep and goats)	1	25	25	—	—	—
	Pleuro-pneumonia (goats)	14	101	101	—	—	—
Northern Province	Rabies	2	9	—	9	—	—
	Pleuro-pneumonia (goats)	—	38	38	—	—	—
	Anthrax	—	6	6	—	—	—
	Foot-and-mouth	42	53	—	1	10	42
	Black Quarter	323	581	581	—	—	—
North-Central Province	Foot-and-mouth	327	1,045	2	—	716	327
North-Western Province	Rabies	—	2	—	2	—	—
	Foot-and-mouth	—	49	2	—	47	—
	Black Quarter	—	3	3	—	—	—
Central Province	Mange (cattle)	20	176	8	—	148	20
	Foot-and-mouth	—	348	1	—	347	—
	Piroplasmosis	1	2	—	—	2	—
	Black Quarter	—	14	14	—	—	—
Province of Sabaragamuwa	Rabies	1	5	—	5	—	—
	Anaplasmosis	—	1	—	—	1	—
Province of Uva	Black Quarter	—	11	11	—	—	—
	Rabies	—	6	3	3	—	—
Eastern Province ..	Rabies	—	5	1	4	—	—
Southern Province	Anaplasmosis	—	1	—	—	1	—
	Rabies	5	5	—	5	—	—

Peradeniya, CEYLON,
August 23, 1951.

T. M. Z. MAHAMOOTH, M.R.C.V.S.,
Deputy Director (Animal Husbandry),
and Government Veterinary Surgeon.

METEOROLOGICAL REPORT, JUNE, 1951

STATION	TEMPERATURE				HUMIDITY		Amount of Cloud	RAINFALL		
	Mean Maximum	Offset	Mean Minimum	Offset	Day	Night (from Minimum)		Amount	No. of Rainy Days	Offset
	°	°	°	°	%	%		in.		in.
Agalawatta	—	—	—	—	—	—	—	—	—	—
Anuradhapura	88·1	—1·7	76·3	—0·1	68	86	6·0	0	0	— 0·73
Badulla	83·1	—2·3	66·1	+0·8	68	92	6·0	0·96	10	— 0·58
Batticaloa	91·3	—1·0	77·6	—0·1	62	80	6·7	0·98	6	+ 0·09
Colombo	84·7	—0·7	76·7	—0·6	82	88	7·3	9·36	24	+ 0·70
Diyatalawa	75·2	—2·4	64·5	+1·3	68	79	6·4	1·30	17	— 0·66
Galle	83·1	—0·5	74·5	—2·8	80	86	7·0	14·59	27	+ 6·15
Hakgala	—	—	—	—	—	—	—	—	—	—
Hambantota	83·5	—3·0	75·9	—0·9	85	88	6·7	6·87	20	+ 4·76
Jaffna	87·1	+0·5	81·4	+0·5	76	81	6·1	0	0	— 0·39
Kandy	80·7	—2·6	71·2	0	82	90	7·4	14·00	30	+ 5·17
Kurunegala	85·7	—0·8	75·7	+0·1	76	86	6·8	4·00	22	— 2·79
Mannar	88·0	—0·2	80·7	+0·1	76	82	6·6	0	0	— 0·36
Nuwara Eliya	62·4	—3·2	55·9	+0·3	93	94	7·6	28·70	27	+18·27
Puttalam	84·8	—1·5	79·3	+0·1	78	82	6·6	0·13	1	— 1·27
Ratmalana	84·6	—	75·8	—	79	86	7·4	10·83	26	+ 1·85
Ratnapura	84·9	—1·8	74·4	—0·3	82	90	7·5	27·20	28	+ 8·65
Talawakele	67·2	—3·6	60·3	—0·1	90	91	7·8	33·25	29	+19·97
Trincomalee	91·9	—0·3	79·2	+0·2	60	76	6·8	0·04	1	— 0·89

WEATHER SUMMARY, JUNE, 1951

The south-west monsoon strengthened considerably in June and continued strong till about the end of the month, resulting in frequent overcast skies, strong south-westerly winds, occasionally reaching gale force, and constant rainsqualls in the south-western parts. Strong winds caused much damage to house and property in addition to dislocating telegraphic and telephone communications, while persistent rain resulted in considerable local flooding in the low-lying areas in the low-country and interruption to rail and road traffic from earth-slips up-country.

Among the hills, rainfall accompanied by strong winds, with little or no sunshine, was a daily experience throughout the month. A number of stations recorded totals exceeding 40 inches, the highest being 57·51 inches at Watawala, 53·93 inches at Gonapenigala Estate, 53·55 inches at Norton Bridge, 51·91 inches at Luccombe Estate, 50·92 inches at Abergeldie Group, and 50·25 inches at Blackwater Estate.

For some stations situated among the central hills this was the wettest June on record. Nuwara Eliya with a total of 28·70 inches, beat its previous highest June total of 27·85 inches, recorded as long ago as in 1873. That is to say, Nuwara Eliya never had a wetter June in 78 years. Similarly, 48·42 inches at Hatton was a record for 55 years, against the previous highest total of 45·14 inches in 1923, and 40·65 inches at Kabaragalla Estate, Maturata, a record for 66 years against the previous highest total of 34·76 inches in 1904.

From the central hills there was a rapid decrease in rainfall to the north and the east, and monthly totals outside the south-west quarter were mostly below 2 inches. Bright weather prevailed in the northern half of the Island with practically no rain at all.

The rainfall was considerably above normal among the central hills, the monthly totals at many stations being nearly double the average. The greatest excesses were 29·94 inches at Gonapenigala Estate, 29·08 inches at Kabaragalla Estate, 26·97 inches at Hatton, 26·96 inches at Maskeliya, and 25·54 inches at Luccombe Estate. The excesses in the south-western low-country ranged from 5 to 10 inches. The larger deficits (of the order of 5-10 inches) occurred in Negombo District and in the southern parts of North-Western Province where the rainfall recorded was about half the average. The greatest deficits were 5·71 inches at Negombo, 5·69 inches at Pannala, 5·65 inches at Dankotuwa, and 5·63 inches at Ambepussa.

Although the monthly rainfall at some stations was exceptionally high in June, there were only two daily falls over 5 inches, 5·81 inches at Nivitigala on the 8th and 5·27 inches at Norton Bridge on the 2nd.

Day temperatures were well below normal except in the north and the east, while night temperatures were on the whole about average. The highest recorded temperature in the shade was 95·8° at Batticaloa on the 7th, while the lowest temperature for a low-country station was 70·4° at Galle on the 23rd. The lowest temperature for the whole Island was 53·9° at Nuwara Eliya recorded both on the 26th and 28th. The mean day humidity varied from 80 to 90% in the wet zone and from 60 to 75% in the dry zone. The night humidity ranged mainly from 80 to 95%. The cloud amounts were well above average. The wind strength was about normal, the prevailing direction being south-westerly.

D. T. E. DASSANAYAKE,
Director.

METEOROLOGICAL REPORT, JULY, 1951

STATION	TEMPERATURE				HUMIDITY		Amount of Cloud	RAINFALL		
	Mean Maximum	Offset	Mean Minimum	Offset	Day	Night (from Minimum)		Amount	No. of Rainy Days	Offset
	°	°	°	°	%	%		in.		in.
Agalawatta	—	—	—	—	—	—	—	—	—	—
Anuradhapura	89·6	—1·4	75·9	—0·1	64	84	6·0	1·16	3	— 0·16
Badulla	84·4	—1·9	64·8	+0·7	66	94	5·2	0·74	9	— 1·43
Batticaloa	89·9	—2·3	76·4	—0·6	64	82	5·2	1·09	4	+ 0·05
Colombo	83·8	—1·0	76·3	—0·7	82	88	7·0	10·97	18	+ 5·48
Diyatalawa	75·9	—2·2	62·1	—0·5	68	84	6·2	4·07	13	+ 2·11
Galle	82·6	—0·2	74·5	—2·3	79	84	6·3	8·15	22	+ 1·81
Hakgala	—	—	—	—	—	—	—	—	—	—
Hambantota	84·3	—3·3	75·8	—0·5	80	88	6·0	1·69	12	— 0·32
Jaffna	86·1	0	79·6	—0·3	78	85	6·0	0·58	2	+ 0·03
Kandy	82·2	—0·6	70·2	—0·5	77	87	6·6	5·10	17	— 2·22
Kurunegala	85·4	—1·0	74·6	—0·7	74	86	6·5	5·74	16	+ 1·86
Mannar	86·9	—0·5	78·8	—0·4	77	86	6·4	0	—	— 0·35
Nuwara Eliya	64·6	—0·7	54·9	+0·1	86	91	7·2	9·32	23	— 1·70
Puttalam	85·7	—0·3	78·0	—0·4	76	84	6·4	0·05	1	— 0·94
Ratmalana	83·5	—	75·6	—	78	86	6·7	13·82	14	+ 8·36
Ratnapura	85·3	—1·3	73·6	—0·9	78	90	7·2	15·31	23	+ 2·54
Talawakele	70·3	+0·1	59·4	—0·1	86	91	7·1	11·16	23	— 2·14
Trincomalee	92·0	—0·5	77·3	—0·8	63	78	6·4	1·44	4	— 0·29

WEATHER SUMMARY, JULY, 1951

Active monsoon weather prevailed over the greater part of July, but the winds were less strong and the rainfall much less than in June. A few squalls exceeding gale force (38 m.p.h.) were recorded at the Colombo Pilot Station during the second half of the month. Rain (mainly confined to the south-western parts) was experienced, more or less frequently, till about the 25th. Thereafter the weather turned predominantly dry. Rain was heavy and widespread on the 11th and 12th, particularly on the 11th, when a large number of stations in the western low-country and mid-country recorded falls exceeding three inches.

The biggest monthly totals occurred on the south-western slopes of the hills, where Watawala recorded 28·40 inches, Maliboda Estate 27·20 inches, Kenilworth Estate 25·74 inches, Padupola 24·65 inches and Dabar Estate 24·21 inches. Comparatively large totals (exceeding 15 inches) were also recorded in the Kalutara District, chiefly as a result of the heavy rain that fell during the period 10th to 12th.

Outside the south-west quarter, the weather was generally bright and dry, rainfall being generally below 2 inches. Some stations in Puttalam and Mannar Districts and in the extreme north received no rain at all. Widespread thunder activity was experienced in the north and the east of the Island from the 7th to the 9th.

Largest excesses occurred in the Western Province and neighbourhood, e.g., 11·78 inches at Pimbura, 10·61, inches at Sirikandura Estate, 10·55 inches at Gikiyanakanda Estate, 8·56 inches at Horana and 8·36 inches at Ratmalana. Biggest deficits occurred among the central hills, outstanding examples being 7·05 inches at Norton Bridge, 6·92 inches at Abergeldie Group, and 6·54 inches at Theydon Bois Group.

There were 18 daily falls of 5 inches or over, all of them on the 11th or the 12th. The highest were 8·50 inches at Minuwangoda and 7·32 inches at Hanwella, on the 11th.

A hailstorm was reported from Periya Aru, Batticaloa, on the 29th.

Day temperatures were well below normal in the south-east and a little below normal elsewhere. Night temperatures were also below normal. The highest recorded temperature in the shade was 96·4° at Batticaloa on the 31st, while the lowest temperature in the low-country was 70·9° recorded on the 24th both at Galle and Kurunegala. The lowest temperature for the whole Island was 51·2° at Nuwara Eliya on the 5th. The mean day humidity varied from 75 to 85% in the wet zone and from 65 to 75% in the dry zone. The night humidity ranged mainly from 80 to 90%. The cloud amounts were above average. The wind was slightly below the average strength, the prevailing direction being south-westerly.

D. T. E. DASSANAYAKE,
Director.